

Contractors *and* Engineers Monthly

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*Be Sure
to Read*

• Bridge Repairs

Particularly timely in its appeal to the interest of highway engineers along the Atlantic seaboard is one of this issue's feature articles describing the repair and reconstruction of a hurricane-damaged causeway across Lavaca Bay in Texas. See page 1.

• Well Operated Highway Shops

The equipment shops of highway departments have played a vital part in the valiant battle to keep equipment working for the duration. A detailed article in this issue describes the very well equipped and well run highway shops in New Jersey and the Department's thorough program of inspection and equipment care, and contains points of value to equipment engineers operating shops both large and small. See page 2.

• Road Resurfacing Speeded

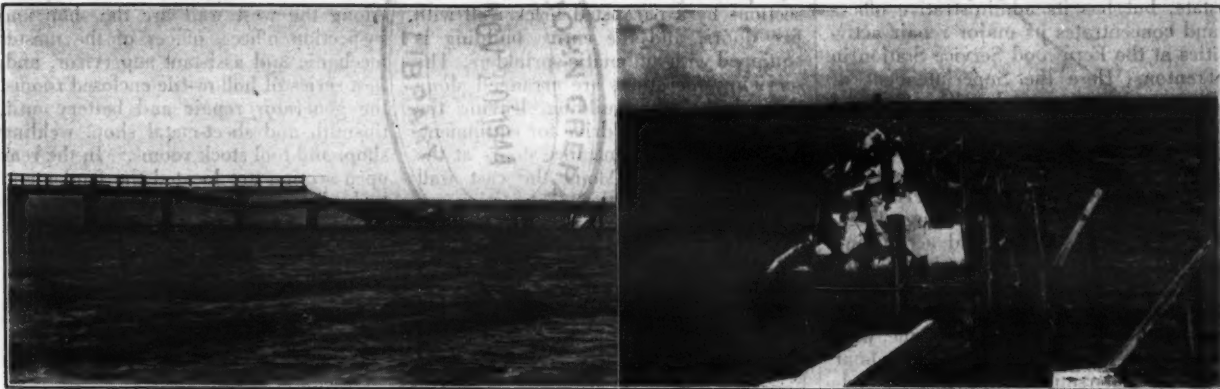
The development of a method of pre-treating aggregate to be used in bituminous maintenance and resurfacing in Massachusetts has licked the problem of wet weather. Other phases of highway maintenance work in West Virginia and Connecticut are also described in this issue. See pages 7, 43, and 83.

• Jobs for Disabled Veterans

Along with your other planning for the post-war period, don't neglect your responsibility for providing jobs in the construction field for returning service men who bring back to civilian life permanent disabilities from their battle experiences. Some suggestions by leaders in the field appear in this issue. See page 8.

• Airport Extensions

Two contracts for extending present Army airport facilities are covered in this issue. One describes the Army's use of rolled concrete for apron paving at an airport in New York State, and the other, the use of rock-asphalt surfacing for additional runways at a Texas airfield. See pages 17 and 25.



Storm-Damaged Bridge Requires Major Repairs

† THE Gulf storm of August, 1942, so seriously damaged the almost 2-mile-long causeway across Lavaca Bay, north of Port Lavaca on Texas Highway 35, the shortest route between Corpus Christi and Galveston, that it was necessary completely to rebuild two long sections, totaling 6,330 feet, and extensively repair the remainder. A contract for this work was awarded in the summer of 1943 to Moore & Turner, San Antonio, Texas, by the Texas Highway Department, and the work was pushed to completion in August, 1944, despite serious delays from wind, tides and rain.

Salvage

The first operation undertaken under this contract was the salvaging of wood piling and floor stringers which had been displaced but not destroyed by the storm. This work was done from a 40 x 140-foot wooden barge on which a 40-hp oil-fired boiler furnished steam for a

Texas Highway Department Lets Contract for Repair And Rebuilding; Usable Piles And Stringers Salvaged

By FRANK B. SARLES,
Western Field Editor

(Photos on page 88)

double-drum Clyde hoist with a nigger-head winch. A 15-ton stiffleg derrick with a 180-degree swing and a 60-foot boom on the barge pulled the old piling and salvaged such 6 x 18-inch 20-foot-long fir stringers as were still usable.

No attempt was made to salvage the old concrete slabs which were attached to only the outside stringers by the guard-rail posts. These posts were cut loose; the old slabs, most of which were considerably shattered and twisted, were left submerged in the 4 to 8-foot deep waters of the bay; and the salvaged

stringers were loaded on a 24 x 80-foot wooden barge, hauled to shore, sorted, and re-worked. Breaks were treated with hot creosote and tar, and stringers and piles were stocked for re-use.

In pulling the old piling, the same barge and derrick were used with the addition of a jet, made from 30 feet of 1½-inch pipe with its lower 2 feet perforated. Water for the jet was supplied through a 4-inch suction line from the bay by a gasoline-powered centrifugal pump mounted on the barge. The jet was handled by a line from the nigger-head winch while both drum lines were attached to the pile being pulled, with a constant strain applied while the jet was being operated to a point below the pile splice. In cases where the old pile parted at the splice, no attempt was made to salvage the bottom portion.

(Continued on page 12)

ICE—THE WINTER HAZARD—LIES AHEAD. ARE YOU PREPARED?



One of Montana's most difficult winter maintenance problems is ice on roads. In addition to the use of abrasives, road signs warn the traveling public of icy conditions. At right, a typical storehouse with gravity feed for sand used on icy pavements. See page 22.



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Shops, Not Shopping, Extend the Service Of Road Machines

**N. J. Highway Department
Has Thorough Program of
Inspection and Care for
Maintenance Equipment**

By J. K. SMITH

† THE New Jersey Highway Department, in its well planned program of maintenance and repair service for automotive equipment, has established facilities in five districts throughout the state, but has its administrative offices and concentrates its major repair activities at the Fernwood Service Station in Trenton. Here the Superintendent of Plant and Equipment has his office and directs the work throughout the state, and here also are located the testing laboratories, the storage warehouse, the research division of the engineering department, electrical and drafting offices, the Fernwood auditing and accounting office, and the inspection department. The headquarters for the other service-station districts are at Newark, Toms River, Vineland, and Merchantville, with subsidiary garages and service plants at Dover, Paterson, Somerville, Woodbridge, New Brunswick and Cliffwood. Gas and oil service, tune-up and troubleshooting, and minor repairs are available at all these stations which also serve as centers for the Department's snow-removal activities.

Fernwood Service Station

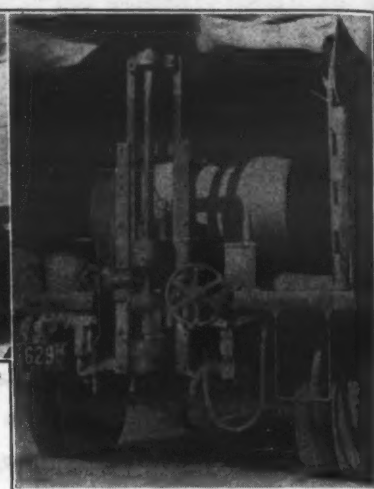
This station is situated on a 28-acre tract and comprises ten main buildings and about a dozen smaller ones. The buildings are modern, well designed and arranged, and are surrounded by attractively landscaped grounds and lawns. Entrance is from one of the main highways leading west from Trenton. Twenty-four-hour guard service is maintained at the gate, and a traffic light has been erected just outside to be operated by the guard when equipment is entering or leaving the grounds, as an assurance

against traffic accidents. Just inside the gate is an asphalt-surfaced parking yard, accommodating 125 cars, whose use prevents the blocking of driveways and building entrances by employees' cars and hence facilitates the moving of equipment.

Practically all repairing and servicing of equipment is done in the main service building. This is a high one-story structure, 100 x 400 feet, with brick walls and a wood roof on open steel trusses, and with a wood-block floor. The building is divided into two fire sections by a parapeted brick wall with fire doors, and the entire building is equipped with automatic sprinklers. The servicing operations are arranged along the sides of the building, leaving the center as a through drive for equipment, with large double entrance doors at the front and rear. Along the east wall lengthwise through the front section are



New Jersey State Highway Department Photos
Truck-mounted equipment, owned by the New Jersey State Highway Department, runs from a Lorain 40 shovel on a Mack to a truck-mounted core drill for pavement sampling.



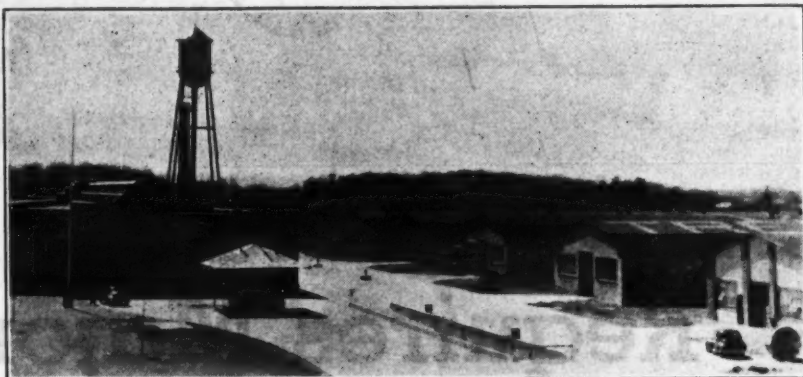
shop, blacksmith shop, woodworking department, testing department, and inspection offices. The boiler room is in a small basement.

Service Shops

The machine shop contains the needed equipment for overhaul jobs on engines and highway equipment. Included are a 21-inch LeBlond heavy-duty lathe, an American Tool Works 20-inch x 6-foot lathe, a heavy-duty Chard lathe, two Lodge & Shipley lathes, several small lathes for light work, a Rockford milling machine, a No. 2 Allen drill press, gear cutters and pullers, a Heald cylinder grinding machine, buffers and grinders, two Ideal mower sharpeners, a shaper, presses, and other usual equipment for a well arranged shop.

One of the most interesting pieces of equipment here is the Mogul Metallizer for rebuilding worn parts with metal. This has been an especially effective tool in the salvaging of parts so difficult to secure in these times. Worn Ford king pins, hard to obtain here, have been rebuilt and installed as good as new. Transmission shafts can be replaced with less loss of time. In this metallizing operation, the metal is in the form of a coil of wire which is fed into the nozzle of the apparatus where it is melted by acetylene flames, and the molten metal is discharged in a micro-fine spray by air pressure. In the case of a round piece, such as a transmission shaft, the piece is mounted and turned in the lathe, and the metallizing apparatus mounted on the lathe sprays the piece as it turns. Ferrous and non-ferrous metals can be used, and, in the case of the former, varied hardnesses are available. Prior to applying the metal, a true-up cut is taken over the worn section, then this section is rough-threaded to afford additional binding power, and the metal is sprayed on. After the worn section is built up, the piece is finished in the lathe to proper size.

The motor-rebuilding shop now takes care not only of internal-combustion engines damaged by accident but is rebuilding engines on all regular equipment. Normally a piece of equipment, after 50,000 to 100,000 miles of service, is taken to Fernwood for examination and complete overhaul. The engine is removed and thoroughly checked for wear. All light equipment showing 0.008-inch or more wear in the cylinders and all heavy equipment showing 0.010-inch or more wear are completely torn down and rebuilt. In the case of straight-line motors, the cylinders are rebored and resleeved, and new pistons, piston pins, connecting rods and bearings, main bearings, and valves are installed as required. In the case of V-type Ford motors, the cylinders are rebored to a size larger to permit the introduction of sleeves and so to allow the use of standard sizes in making the replacements of pistons and other parts. In the case of crankshafts or other parts found worn, the metallizing treatment is used to restore them to the original size and they are reinstalled. This has resulted in



New Jersey State Highway Department Photo
The Fernwood Service Station of the New Jersey State Highway Department at Trenton, N. J.

The County's Big Job In Post-War Planning

† MOST county highway departments, in cooperation with the county boards or commissions, have already embarked on a program of planning for post-war construction projects. In some counties, however, beyond a rather general determination to "build and improve a number of miles of roads", the post-war programs have not yet taken definite shape. In other counties, even where the actual blueprints of the post-war construction program have been made, many of the details which would accelerate the undertaking of the work are being neglected.

Winter maintenance in New Jersey. At left, a sand and cinder spreader with safety seat; below, a V-plow in action.

New Jersey State Highway Department Photos



Earmark Your Funds for Projects That Are Planned Ready for Contract and the Right-of-Way Is in the Bag

Funds First

Post-war planning necessarily starts with financing. Funds must be earmarked, not merely to a general road and bridge fund, but, as plans and specifications are developed, to definite individual projects. The letting of a contract for regrading 7.9 miles of County Road H from the junction with TH 19 to Ibsen's Corner will be comparatively simple within a matter of days after Victory if the plans and specifications are ready and the funds are allocated. Specific commitments must be made. Funds on hand for specific projects will also hasten and simplify securing such state or Federal contributions as are legislated to those secondary road projects approved for inclusion in feeder-road programs.

Right-of-Way

After determining which projects shall be undertaken immediately after the war and in what priority the work shall be started, and with financing and engineering in readiness for the coming big push on the home front, county engineers working in cooperation with county boards may now proceed with right-of-way acquisition. Obtaining rights-of-way for county road projects is usually comparatively simple.

In many Minnesota and Iowa coun-

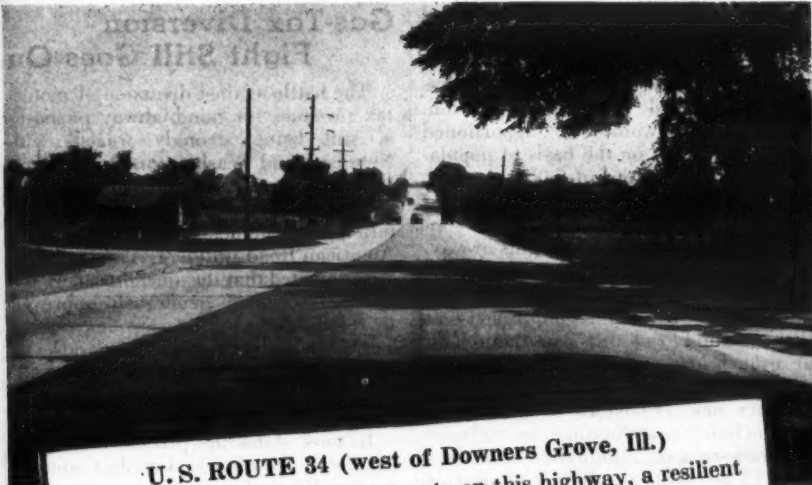
(Concluded on page 20)

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CHECK YOUR ROAD PROBLEM

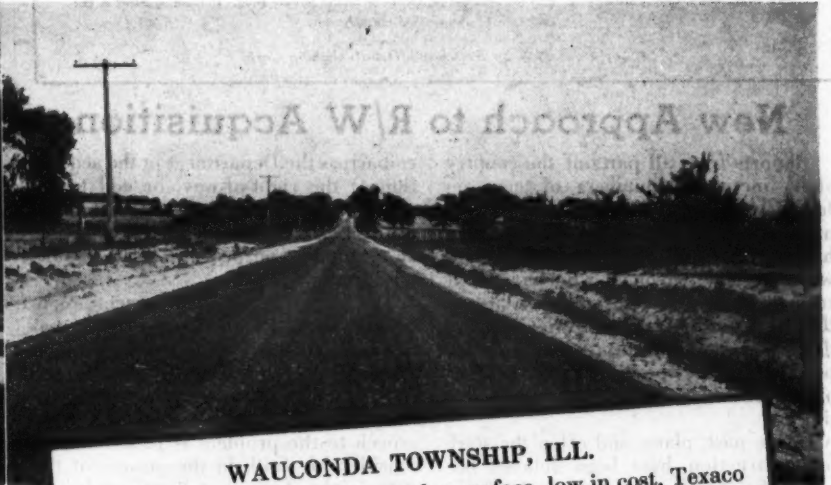
against these recent **TEXACO** projects

Let's look briefly at these four recent Texaco Asphalt road projects. One of these types of surfacing may very well offer an economical, effective answer to a road problem now confronting you.



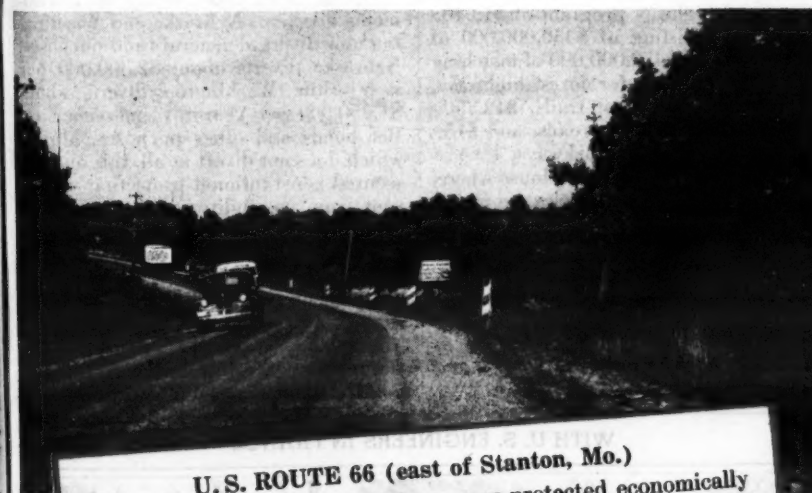
U. S. ROUTE 34 (west of Downers Grove, Ill.)

To save nine miles of worn concrete on this highway, a resilient Texaco Asphalt surface of the plant-mixed type was laid over the middle 18 feet of the old road. The new Texaco pavement is 1½ inches thick in the center and feathers out at the edges.



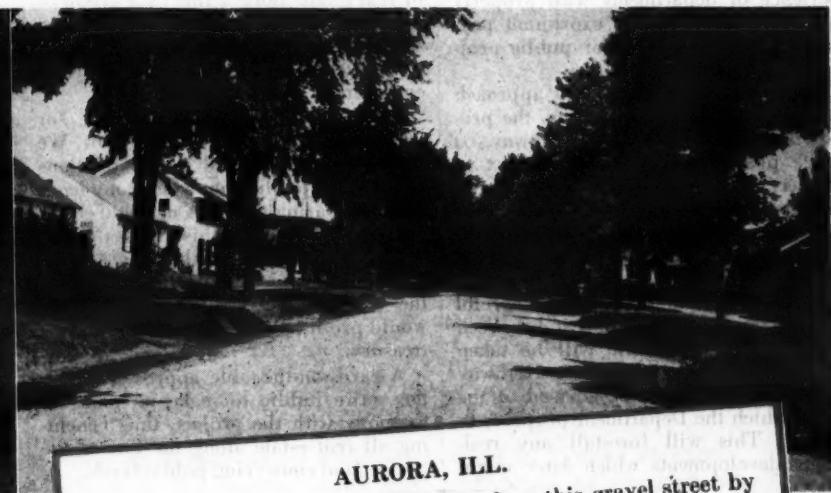
WAUCONDA TOWNSHIP, ILL.

To fulfill the need for an all-weather surface, low in cost, Texaco construction of the road-mix type was used on this road. Texaco MC-3 Cutback Asphalt and gravel were mixed thoroughly to a 3-inch loose depth, rolled and given an asphalt seal coat.



U. S. ROUTE 66 (east of Stanton, Mo.)

The worn concrete on this highway was protected economically and effectively by giving it an application of a soft grade of Texaco Asphalt by pressure distributor, covering the asphalt with pea gravel.



AURORA, ILL.

A dustless, waterproof mat was formed on this gravel street by giving it an inexpensive application of Texaco Cutback Asphalt, which was then covered with pea gravel.

Texaco Engineers, who are Asphalt specialists, are at your service

THE TEXAS COMPANY, Asphalt Sales Dept., 135 East 42nd St., New York City (17)
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TEXACO ASPHALT

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New Approach to R/W Acquisition

Reports from all parts of the country show increasing numbers of men released from war industries and from the armed forces who are returning to state highway design departments. These men, with the new personnel who have been trained as a part of the war activity of the departments, should alleviate the design-personnel shortage and make possible greater speed in the completion of contract drawings for post-war lettings.

In the past, plans, and often the start of construction, have been delayed because of right-of-way problems. In many states where large projects have been under consideration, there has been great secrecy as to the final location of the projects until the right-of-way agents had secured as much of the property required as possible without condemnation proceedings coming into the picture. This method has resulted from the experience of departments with property owners holding out for exorbitant payments for land needed for public projects.

Connecticut has taken a new approach to the right-of-way problem on the proposed Fairfield County Parkway, a large post-war construction project to connect with New York state parkways. No attempt has been made yet to acquire any right-of-way for the project, nor will any probably be acquired for several years, according to State Highway Commissioner William J. Cox. After careful thought and consideration, it has been decided that the public will be taken into the confidence of the State Highway Department and will be advised of the route which the Department proposes to follow. This will forestall any real-estate developments which later might

embarrass the Department in the acquisition of the right-of-way, or add to the expense through the need for costly demolitions, or even compel the adoption of an alternate, and probably less satisfactory, route.

The State Highway Department is conferring with the officials of the towns in the lower part of the state through which the new project will pass to discuss its location, thus giving full publicity to the projected route. This approach to the problem is predicated on considerable faith in the powers of the state's right of eminent domain to insure acquisition of all needed real estate later. It is expected, however, that the reliance on the good faith of the public will work out much more satisfactorily than trying to keep hidden the proposed location which, in the very nature of things, is bound to become more or less known through the continued purchases of real estate along a line by a group of right-of-way agents, or the continued resurveying of a certain strip of territory by parties of state highway department engineers.

Connecticut has set an example for other states, and counties, to follow. We believe that it is good public relations to take the public into your confidence when preparing to start a new and costly project. In addition, this smokes out at as early a date as possible any opposition to the project, either organized or the "lone wolf" real-estate owner who would profit at the expense of the public treasury.

A cards-on-the-table approach allows the entire public to make its plans in harmony with the project, thus benefiting all real estate along the line of the project and conserving public funds.

Brazil Needs Equipment For Highway Program

An ambitious program of highway construction, designed to coordinate and improve existing transportation systems and to augment them sufficiently to support the economic expansion of territories, has recently been adopted by the Brazilian government. In 1940, according to a survey made by the Brazilian Commission of Inter-American Development, Brazil had 155,000 miles of highways, more than half of which were rough-surface roads. Present highway facilities, divided into a northern system of minor importance and a southern system of somewhat greater capacity, are reported to be in poor condition and with no inter-connections between the north and south. In order to integrate and improve these inadequate and isolated transportation systems, the government of Brazil proposes to construct three groups of highways, totaling 24,000 miles. One group would run north to south, one from east to west, and the

third to connect important points of two or more trunk highways. The north-to-south group would include the Getulio Vargas Highway between Belem, at the gateway to the Amazon, and Jaguarao in the south, approximately 3,700 miles.

Brazil urgently needs equipment to carry out this much-needed road-building program, particularly tractors and similar machines for opening up new roads and for improving and maintaining existing ones; vehicles of all kinds, especially those of simple construction and adapted to road conditions and the Brazilian climate; fuel and lubricants; and spare parts.

Surveys conducted by the American Road Builders' Association have shown that highway and street needs for the next several years total in the neighborhood of \$16,000,000,000. Of that amount, urgently needed construction, to replace the deficiencies which developed during the depression and during the war, will total at least \$10,000,000,000.

Senate Passes Bill On Post-War Roads; House Defers Action

The Hayden Post-War Highway Bill (S.2105), carrying authorizations of \$1,350,000,000 for the three post-war years, has been passed by the Senate. This bill provides annual authorizations of \$450,000,000, divided as follows: Federal-Aid highways, \$200,000,000; secondary and feeder roads, \$125,000,000; urban highways, \$125,000,000. The states are required to match these funds on a 50-50 basis, which will provide a total annual program of \$900,000,000.

Funds for projects on the Federal-Aid highway system would be apportioned among the states as provided in Section 21 of the Federal Highway Act (one-third area, one-third population, and one-third mileage), and secondary funds would be apportioned in a similar manner, except that rural population has been substituted for total population. Urban funds would be apportioned among the states on the basis of population in municipalities of 5,000 or more.

By a close vote, the Senate eliminated all reference in the bill to Federal contribution for costs of rights-of-way. These provisions were stricken from the bill by an amendment sponsored by Senator Russell of Georgia who argued that the states and local units can obtain land at a much lower figure than the Federal government.

Other new provisions of the Senate bill include: contributions by railroad for grade-crossing elimination of not less than 15 per cent; precluding of start of construction contracts before the beginning of the first post-war year; states having exclusive jurisdiction of all highways may use secondary funds on Federal-Aid system; and states with a population density of more than 200 per square mile may expend secondary funds without regard to municipal boundaries.

As passed by the Senate, the bill sets up a total highway program of \$1,040,250,000, consisting of \$450,000,000 of Federal funds, \$450,000,000 of matching funds, \$75,000,000 for forest highways, \$37,500,000 for forest trails, \$12,750,000 for National Park roads, and \$15,000,000 for National parkways.

The bill now goes to the House where, according to informed circles, no action will be taken until after election.

At one time and by a single gift, you may contribute to the welfare of your own community, to the armed forces, and to victims of war abroad. Send in your gift to the National War Fund today.



"You gotta hand it to them Seabees."

Gas-Tax Diversion Fight Still Goes On

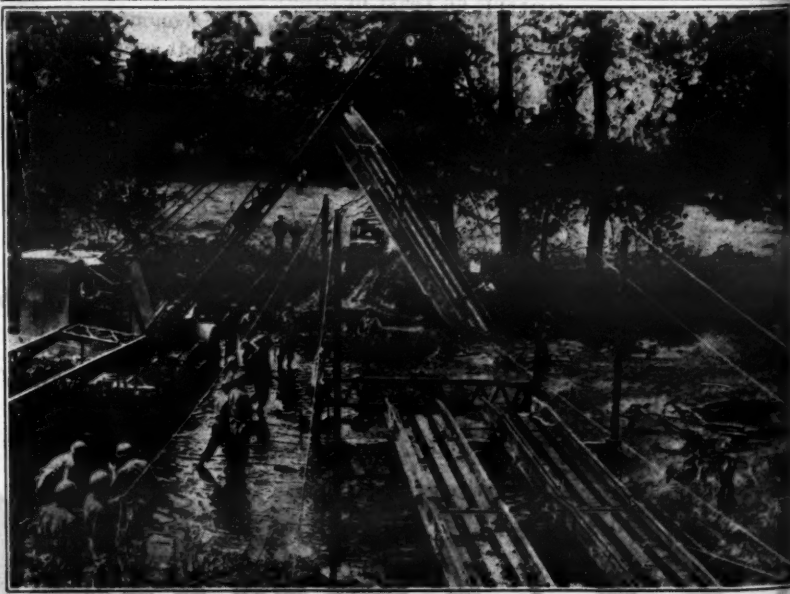
The battle against diversion of motor-tax revenues for non-highway purposes is still being strongly waged, with Nebraska and Washington this autumn probably joining the ranks of the fifteen states that have the protection of constitutional amendments, according to the American Road Builders' Association. It is anticipated that the amendments in the two states will be generously approved by reason of the public acceptance which has always greeted such proposals. It is interesting to note that never yet have the voters of any state rejected such an amendment.

In most states the process of amending the constitution is slow. In Connecticut and Pennsylvania, for instance, anti-diversion amendments have been approved by one session of their state legislatures, and another passage is required before the amendments can get to a vote of the people. Under Kentucky laws, the anti-diversion amendment, approved by the legislature, cannot be voted on by the people until 1945.

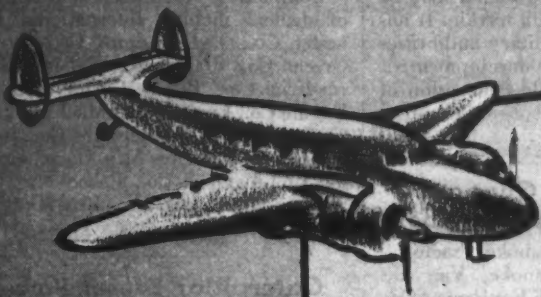
Of the three states voting on amendments this year, Nebraska and Washington now divert to general-fund purposes. Nebraska diverts about \$2,300,000 per year while Washington diverts about \$1,250,000 per year for emergency relief bonds and other purposes. Maine, which does not divert at all, this autumn secured constitutional protection to prevent any possibility of losing sorely needed highway funds.

The fifteen states on the honor roll, having anti-diversion constitutional amendments, are: California, Colorado, Idaho, Iowa, Kansas, Maine, Michigan, Minnesota, Missouri, Nevada, New Hampshire, North Dakota, Oregon, South Dakota, and West Virginia.

WITH U. S. ENGINEERS IN FRANCE



U. S. Army Photo from British Combine
French civilians are interested onlookers as U. S. First Army Engineers use a portable crane to swing a steel span into place in a bridge. This emergency crossing over the Vire River speeded up the Allied advance in the Vire-Mortain sector in France.



PIONEERED

by
Seaman

The SEAMAN MIXER Scores again!

The airport at La Crosse, Wisconsin is excellently located on the flat land near the Mississippi River and in present area and in expansion possibilities is a credit to the city it serves.

In a part of the area, however, which the higher speeds of present day transport aircraft called into use, a rolling condition of the terrain presented serious hazards. Rises as high as five and six feet required fills to level. In addition to earth moving equipment, the SEAMAN PULVI-MIXER served in an ingenious application to further compaction in the fills. Operating over successive eight inch lifts, the SEAMAN mixed sand and top soil — and mixed and pulverized so thoroughly that the rollers were able to produce a compaction that ran nearly 95% of theoretical. The mixing was accomplished without the use of water.

Engineers in charge of the construction expressed utmost gratification with the work of the SEAMAN for not only was the mix more thorough but the work was done in a fraction of the time other methods would have taken.

* * *

In grade fills, earth embankments, dams or levees when moisture is used to further compaction, the SEAMAN MIXER is used following the water distributor just prior to sheepfoot rolling. Engineers report as much as a 12% increase in density over that obtained with ordinary tools.

* * *

Many turf airfields or airfield areas develop sharp ridges and declivities — an annoyance and a danger in taxiing, take-offs and landings. In effecting repair, the old sod must be thoroughly pulverized to prevent a recurrence of lumps after the new grass has grown. Not only does the SEAMAN MIXER reduce the hard, compacted sod to loose, completely pulverized soil, but it greatly facilitates the general grade leveling.

* * *

So it's not only for road mixing — but for a multitude of other jobs as well — that the SEAMAN is pre-eminent.

More popular than ever! The 1944 edition of Soil Stabilization Methods, a compilation of up to the minute practices in highway and runway stabilization. Write for Bulletin E-24.

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U. S. Army Photo

The Tankdozer tears into an enemy pillbox.

Bulldozers vs. Hedges In the Normandy Push

The good old bulldozer really came into its own as a modern fighting weapon in the Normandy push. Hydraulically operated Model B-8 LaPlant-Choate bulldozer blades mounted on General Sherman tanks proved their usefulness in breaking through anti-tank obstacles in the "bocage" terrain of Normandy. Where medium tanks without the bulldozer blade were trapped in the Normandy hedgerows, these new Tankdozers quickly cut exits through the earth walls and across the sunken roadways. Trees up to 18 inches in diameter were either snapped off at the ground or pushed over by the bulldozer blade.

The 3½-ton bulldozer blade gives the 40-ton Tankdozer an earth-moving capacity comparable to that of the largest-size 20-ton tractor-dozers. However, the destructive impact of the Tankdozer as a battering ram is almost twice as great because of the greater weight and speed of the tank.

Other advantages of the new engineering development, worked out by engineers of LaPlant-Choate Mfg. Co., Inc., Cedar Rapids, Iowa, in conjunction with U. S. Army Engineers and the Ordnance Department, include the ease with which the blade can be installed on any model tank of the M-4 series. It also can be disconnected from the tank in 10 seconds, but even with the blade in place the tank maintains its full fire-power and maneuverability. While it is intended that the Tankdozer will be used in place of ordinary tractor-dozers only in those cases where the armored protection and fire-power of the tank are needed, nevertheless the Tankdozer seems to be a legitimate offspring of the succession of American 'dozers adapted for military use.

In addition to its use in Normandy to break through the hedgerows and lead the way for mechanized weapons, the Tankdozer was used in Italy to fill bomb craters in roads, to push disabled vehicles off the road, to construct by-passes around blown-up bridges, to dig in half-tracks and other vehicles in forward position within enemy shelling distance, to construct fills over newly installed culverts, to cut through railroad embankments for new roads to replace demolished highway overpasses, to clean out rubble in towns at points blocking traffic, and to fire with the 75-mm gun

and 0.50-caliber machine guns on enemy anti-tank positions and machine-gun nests.

The future use of the Tankdozer in

leading the attack of armored divisions will be of tremendous value. It may be a decisive factor in rough terrain. It has been stated by high military authorities that, as a result of the development of this new weapon, the old conception of "tank-country" can be considered obsolete.

Roanoke Tractor Changes Name to Rish Equipment

The name of the Roanoke Tractor & Equipment Corp., Roanoke, Va., has been changed to the Rish Equipment Co., with W. T. Sherman as Manager and C. Edward Frazier as Assistant Manager. This company is one of a group of Rish Equipment Cos. located in Roanoke and Richmond, Va., and in Clarksburg and Charleston, W. Va.

An announcement will be made later of the opening of the Rish Equipment Co. at Cincinnati, which will mean that Rish sales and service will be available anywhere in the territory extending from Cincinnati to the Virginia tide-

water.

Companies represented by this group of dealers include International Harvester Co., J. D. Adams Co., Barber-Greene Co., Blaw-Knox Division, Bucyrus-Erie Co., Burch Corp., Cummins Engine Co., Euclid Road Machinery Co., Gorman-Rupp Co., Hercules Co., Ingersoll-Rand Co., Insley Mfg. Corp., Koehring Co., Parsons Co., Rosco Mfg. Co., Skilsaw, Inc., and Wm. Bros. Boiler & Mfg. Co.

Caterpillar Diesel Power

A 16-page two-color booklet describing and illustrating the construction and distinctive features of Caterpillar diesel engines has just been issued. Many line drawings and action photographs showing Caterpillar diesel-powered equipment at work on a variety of jobs and under a variety of conditions are included. Copies of this booklet, D43, may be secured direct from the Caterpillar Tractor Co., Peoria, Ill., by mentioning this publication.



JOHNSON FLOAT FINISHER



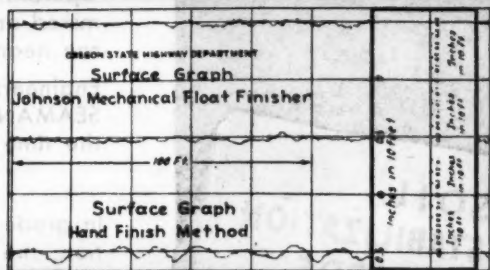
READY FOR EDGING and jointing! That's the way the Johnson Float Finisher works. It duplicates the action of the hand float or trowel. Has a troweling surface of more than 8000 square inches. It cuts off the high spots...fills in the voids...consolidates the mortar...and with mechanical efficiency leaves a finished surface with a variation of .05 inch, or less, in 10 feet—better than any state highway specification requirements.

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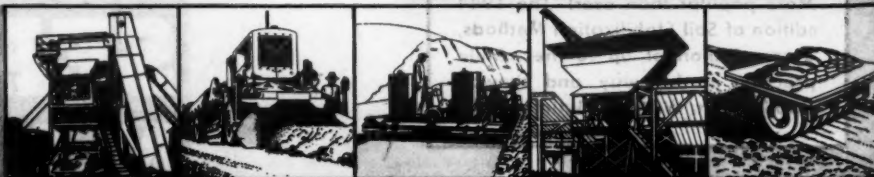
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Pre-Treated Stone Speeds Resurfacing

Massachusetts Develops Method to Make Use of Wet Aggregate Possible on Many Types of Asphalt Work

By WILLIAM H. QUIRK,
Eastern Field Editor

NO longer will wet aggregate, the dreaded enemy of bituminous road surface treatments, harass the engineers of the Massachusetts Department of Public Works, for they have developed a method of pre-treating road aggregate that repels water, they feel, as thoroughly as do the feathers on a duck's back. The solution is applied to the stone aggregate used in surface-treating a road, with results that are highly satisfying to Department engineers.

Laboratory tests apparently sustain this claim for the pre-treated aggregate. In one experiment, pre-treated stone was placed in a bottle of water to which some RC-5 was added. After thorough agitation the water was poured off and the asphalt adhered to the pre-treated stone. In contrast, when untreated stone was used, the asphalt, in the presence of water, made no bond whatsoever with the aggregate. This would indicate that the pre-treated material can be used in rainy weather as it prevents the water from displacing the cut-back. Long waits for a road to dry after a rain are unnecessary when paving with pre-treated aggregate, while maintenance patching can go ahead regardless of the weather. The pre-treatment process was made available for Army use in the Boston area where roads had to be maintained in all kinds of weather.

Resurfacing Concrete

In these days when the laying of new reinforced-concrete paving is practically at a standstill because of the curtailment on the use of steel, more thought is being given to ways of maintaining the concrete paving we have. Throughout the country cracked surfaces of cement-concrete roads are taking on a black covering of some bituminous material, as a rule. Just how this is applied, and in what combination with sand, stone or gravel, depends on such factors as location, traffic need, cost, and the designing skill and ingenuity of the highway engineer. The last factor is probably the strongest, and the method of surface treatment adopted reflects the need of that particular state in its road maintenance program.

The new method by which Massachusetts is resurfacing old concrete roads has been thoroughly tested in the laboratory and the field and is now being put into practical use. A location on heavily traveled Florida-to-Maine U. S. 1 in the northeast corner of Massachusetts, near Rowley in Essex County, was chosen as the site for experimental surface treatment. In 1922, a 20-foot width of 8-inch-thick reinforced-concrete pavement had been laid, which was widened in 1930 to from 30 to 38 feet. Now this paving is in need of serious attention, and the Department engineers decided that a 2-mile stretch of battered concrete should be covered with a flexible surface that employed aggregate pre-treated with the solution developed by the Department.

For the Rowley work, $\frac{3}{4}$ and $\frac{1}{2}$ -inch stone was hauled from Dracut, Mass., 20 miles away, and stockpiled near the job site. As the stone was being unloaded, the treating solution was sprayed over it at 30-pounds pressure by machine. The solution was kept in a 600-gallon tank and was applied cold through a $\frac{1}{2}$ -inch hose with a Kinney single nozzle at the end. The amount of solution applied

was approximately $\frac{1}{2}$ of 1 per cent by weight of the aggregate or about $1\frac{1}{4}$ gallons per ton. An alternate method of pre-treating is to spray the aggregate at the quarry as it is being loaded onto trucks. A third, and perhaps the most positive, way is to treat the aggregate with the solution in a mixer. This method is followed in the case of patching, but is not feasible when large quantities of stone are being handled in a paving operation of any magnitude.

The concrete highway to be surface-treated with this new type of mix received no advance preparation with regard to the filling of cracks or joints. Traffic dirt along the edges of the paving was swept off by a 3-foot Gravelly power broom, and the surface was then ready for the cut-back. In some cases, a spray



C. & E. M. Photo

A Gallon chip spreader on an FWD truck spreading $\frac{3}{4}$ -inch stone on a state resurfacing job at Rowley, Mass.

coat of the solution has been applied to the concrete surface ahead of the cut-back asphalt. One-third the width of the

roadway was closed to traffic as 0.28 gallon of RC-5 was applied per square (Concluded on page 30)



Grip — and plenty of it — is what moves bigger earth yardages faster. And that means tough tires with a clean, sharp bite that won't clog up and spin helplessly under peak loads.

Top tire for such jobs is Goodyear's Sure-Grip with the great, time-proved O-P-E-N C-E-N-T-E-R self-cleaning tread which has no holding pockets, no mud traps to gum up.

See those big, wide, unblocked channels on the Good-

year Sure-Grip pictured here? They sluice out dirt, mud and stones — leave the massive lug bars free and clear to bite deep and keep pulling in any going!

More and more contractors are specifying this great, longer-duty tire because it gives more drawbar pull, more speed, more round trips per shift, more yardage moved per day — more work at less cost!

What's more, Goodyear's exclusive multiple-compounded construction and the extra strength of Goodyear's Rayotwist cord carcass help make these the longest-lasting, hardest-working tires ever to roll a prime mover.

Best way to check these claims is to ask the men who have changed to Sure-Grips. When you do, chances are you'll want Goodyears on all your units.

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Disabled Veterans And Post-War Jobs

A National Responsibility. Each Part of Construction Industry Must Do Its Share; Some Suggestions

† IN an editorial in the March, 1944, issue of CONTRACTORS AND ENGINEERS MONTHLY, we pointed out the importance of making plans now for reestablishing handicapped war veterans in a world at peace, and particularly of providing them with the means of being independent self-supporting members of their communities. We received many favorable comments on that proposal and, since that time, we have been in touch with state and county highway engineers and contractors throughout the country to find out whether or not any definite progress is being made in planning the placement of handicapped ex-service men in jobs in the construction and highway fields.

In a recent radio address which was part of the radio program "The Doctor Fights", Dr. Thomas Parran, Surgeon General of the U. S. Public Health Service, said, "We have a special responsibility to these men who come back with permanent handicaps. Our doctors have preserved their lives. It is for us to see that they live in liberty and the pursuit of happiness. Each of us must receive our returned soldier with pride, neither repelled by nor over-solicitous as to his injury. Most of his anxiety about it will be its effect upon us and upon his chances for a livelihood. We must convince him, and prove it by our actions, that he has the capacity to be useful and happy."

"From what I have seen in our Army, Navy and Public Health Service hospitals, very few handicapped men want to become the permanent wards of the Government and spend the rest of their days in idleness. They have worked hard. They have stood on their feet and slugged it out with the enemy. They have endured more than they dreamed it was possible to endure. They will ask of us—and they will have every right to ask it—useful work which they are mentally and physically able to do."

"Industry, however, needs to retool its thinking before retooling its machinery for post-war production. In the past, men have been ruled by the needs of the machine. After the war, jobs, tools, machines and national planning must be fitted to the men who fought to preserve the nation."

We all subscribe wholeheartedly to Dr. Parran's statement of what our attitude and objectives should be. But unless each industry buckles down to some practical thinking about what it can do to share in this program of rehabilitation, instead of letting some other industry absorb the handicapped, we shall find ourselves bogged down in a great deal of emotional and sentimental oratory, but devoid of the practical opportunities which must be ready for these

men when they are ready for jobs.

State Highway Work

A number of state highway engineers have indicated that definite steps are being taken within their departments to prepare for providing jobs for veterans. G. T. McCoy, State Highway Engineer of California, writes:

"The California Division of Highways has already begun consideration of and planning for the rehabilitation of some 750 of our own employees who are in military service. It has been and will continue to be the policy of this Department to make sure that every person who is on leave of absence will be offered the same opportunity on his return as though he had remained on the job. He will be restored to his old position and will have veteran's preference rights over other employees if it becomes necessary to reduce our forces."

"We are also planning to absorb as many other veterans as possible. The degree to which this may be done will depend on the individuals applying for

positions, as all of our work is under civil service and it is necessary under the law to make all appointments from the names of eligibles who have been successful in passing examinations for various types and classifications of work. Temporary appointments may, however, be made whenever the eligible lists become exhausted, but such appointments may not exceed more than six months during any one calendar year. In most cases, examinations are held before the expiration of the six-months' period and those holding the temporary positions will be permitted to take the examinations. Since the last war, those who have honorable discharges from military service receive veteran's preference over other candidates in these competitive positions."

"During the past few months we have employed quite a number of men who have disability discharges from the military service. In fact, we have been able to offer some type of employment to almost every veteran who has placed

(Continued on page 64)

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Two New Distributors For Wood Roadmixers

The Wood Mfg. Co., 208 West 8th St., Los Angeles, Calif., has announced the appointment of two new distributors, each of whom will act as state distributor for the Wood Roadmixer, a traveling mixing plant. The G. W. Van Keppel Co., 2440 Pennway, Kansas City, Mo., will handle sales throughout the entire state of Kansas, and Herman M. Brown Co., First & Sheridan Sts., Des

Moines 4, Iowa, will represent Wood throughout Iowa.

Production Awards

The Highway Steel Products Co., Chicago Heights, Ill., manufacturer of expansion-joint assemblies, was doubly honored recently. In July, it received the Army-Navy "E" Award for excellence in production and, in addition, R. R. Robertson, President of the company, has been presented with an Army

citation for engineering achievement in the manufacture of critical ordnance products. Only 159 citations of this type have been made since the beginning of the war.

Announcement has been received from the Westinghouse Electric & Mfg. Co., that its Steam Division at Lester, Pa., and the 30th Street Manufacturing and Repair Plant in Philadelphia have each been awarded a fourth renewal of the Army-Navy "E". In addition, the new Merchant Marine Division at Lester has

received a second star for its "M" pennant, awarded by the Maritime Commission.

Of the 100,000 plants in the country eligible to try for "E" awards, only 3,000 or 3 per cent have won "E's" and only 176 a fourth renewal.

Snow plows in sufficient numbers to meet essential civilian needs apparently will be available for the winter of 1944-45, according to recent word from the WPB.

Kiewit's **TOURNAPULLS** show how
**YOU CAN PROFITABLY
HANDLE TOMORROW'S**

Longer Hauls

Average 10 Loads and 120 Cu. Yds. Hourly
on 3000-foot Round Trip Haul

To help build a 600,000-yard earthfill dam near Cumming, Iowa, Peter Kiewit Sons Co. uses 3 Super

C Tournapulls. A time study on the job shows the following performance:

★ MATERIAL	MOIST SANDY CLAY
★ LOADING TIME	50 TO 60 SEC.
★ LOADING DISTANCE	APPROX. 75 FEET
★ HAUL DISTANCE	3000 FEET ROUND TRIP
★ CYCLE TIME	6 MIN. (AVERAGE)
★ NO. TRIPS PER HOUR	10
★ ESTIMATED LOAD PER TRIP	12 CU. YDS.
★ HOURLY YARDAGE	120 CU. YDS.

Like Kiewit and many other alert contractors, you can get profit-increasing yardage on long hauls by using Tournapulls. Here's why—

Tournapull design concentrates load weight on the front drive wheels to give you greater traction, quicker acceleration and faster turning. Carryall Scraper, used with Tournapull, utilizes

same cable-controlled, positive-ejection system which has proved so successful with tractors in past. You get the same one-man loading, hauling and spreading efficiency, but travel 2 to 3 times faster than the fastest crawling tractors. Result: you can move big yardages faster, farther and more profitably with Tournapulls.

Tournapulls spread their own loads on the move, do away with need for special spreading tools. Big pneumatic tires give you plenty of traction with a minimum of wearing parts; also cushion equipment against shock and reduce operator fatigue.

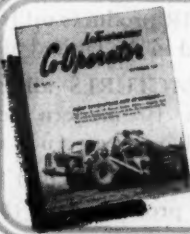


Kiewit's Tournapulls are pushed loaded in 50 to 60 seconds. One pusher handles 3 to 4 Tournapulls, depending on haul length. Compare this loading cost with shovel or elevating grader costs.

LOWER FIRST COST, TOO

What's more, Super C Tournapulls cost from \$500 to nearly \$7,000 less than crawler-scraper units of comparable hourly capacity. Operating costs run approximately 4% to 21% less per hour. Figure what that can mean to you

on a 10,000-hour operating life. Why use more costly, slower-moving rigs when you can have the fast, rubber-tired power of Tournapulls? See your LeTourneau distributor NOW for priority requirements and delivery dates.



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U.S. Engineer Troops Clean Up Cherbourg

German Equipment and Supplies, Left Behind by Hastily Departing Nazis, Used by Americans to Speed Up the Repair of Port Facilities

(Photo on page 88)

† THE remarkable speed of U. S. Engineer Port Construction and Repair Groups in the repair of the port of Cherbourg, key to the Allied supply system in France, is credited to their use of materials and machinery with which the Germans had hoped to halt such progress. U. S. Army Engineers worked with explosives planted at various key points in the port area by retreating Nazis, rebuilding the demolished docks and quays with German materials and, adding insult to injury, used German concrete mixers, shovels and cranes to help get the job done.

One of the biggest jobs which faced the Engineers, once the debris was cleared from the port area and an estimate of the damage could be made, was the filling in of a huge quay face where a great number of cargo vessels could be berthed once the damage done by the enemy demolitionists was repaired.

With captured explosives removed, the Engineers utilized square concrete blocks in facing the blown-out sections of the quay. The fill was then made with broken-up concrete German tank obstacles, found in great quantities in Cherbourg at strategic points and in even greater quantities in a warehouse in the city. To this was added the debris from blown-up buildings and over it all was poured concrete mixed in captured concrete mixers and hauled in captured trucks as well as Army trucks from the United States.

Even the cement used on the unloading platform was an unintended gift from the German High Command. It was cement the Nazis had stored for use on their gigantic rocket-launching platform in the process of being built in this sector when captured. It took approximately one day for American troops to repaint the German trucks captured at the same site and throughout this area and put them in condition

and back to work hauling the concrete to the port area, reversing the Nazi procedure.

Hardly an Engineer regiment in the Cherbourg area is using less than three German steam shovels, a crane or two, and a whole fleet of captured trucks in their operations. Much of the explosives in use by U. S. Army troops up to now has also been donated to the cause by the unwilling Nazis. One Port Repair unit, busy preparing an exit for amphibious trucks, relied almost entirely upon booty in performance of its mission. "De-loused" Nazi Tellermines, dug out of the roads and from in front of German fortifications, were used as charges to blast away sections of the sea wall through which trucks could pass. Concrete roadways utilized cement picked up at the same rocket bases, and Jerry, in the haste of departure, also left behind the lumber from which concrete forms were built.

The rocket bases proved of inestimable value to the U. S. Engineers in the quick repair of the port. The form

lumber, a scarce item in both England and France, which is now being used in the reconstruction of docks and other port facilities where concrete must be poured, came in large part from these bases. Engineers stripped it from the rocket-base forms and brought it into the port. The rocket bases also proved to be a rich source of scarce piling, vital in dock construction. The camouflage nets suspended over the bases hung from great piles which were taken up and driven in the new dock construction.

Other Uses for Captured Supplies

German pipe, valves and fittings also were used freely in repairing the water system and in petroleum installations. German railroad ties and rails were used to augment the existing rail lines about the port in preparation for the heaviest cargo unloading operations that Cherbourg, even in normal times, has ever witnessed. Steel cable, another vital item in heavy construction work, was found in large quantities and is now doing

duty against its makers.

A huge German generator used by the Nazis to power the searchlights on their harbor defense system was captured intact by the advancing Americans. Lavishly booby-trapped, it was skillfully "de-loused" by Army experts and is now doing duty in the port area in lieu of other generators damaged by the Nazis.

According to Francis S. Chase, Jr., Historian for the U. S. Army Corps of Engineers at Cherbourg, that port is a large measure of compensation for all those who feel that the American Army is overweighed with paper work. Advancing so rapidly that only the bare essentials could be carried with them, U. S. Engineers were without paper to make reports until the great quantities of German paper stocks and forms were made available to them. Most of the paper, carbon paper, and envelopes in use in Normandy today by Americans was captured from the Germans. Even the Army news photographers are writing out the legends for their pictures on standard German legend forms.

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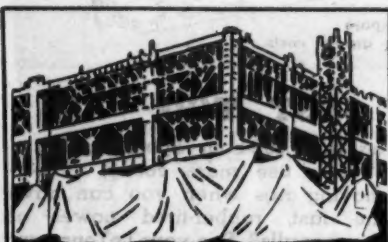
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Steel Enamel Signs**In New Opaque White**

Following the announcement that a white one-coat porcelain enamel had been developed which is a real cover coat for steel plate and does not require an under coat, the Pemco Corp., Eastern and Pemco Aves., Baltimore, Md., received many inquiries and sent out test-coated samples. Many favorable comments have been received. Of interest to highway departments which use large amounts of white enameled plate is the possible use of this porcelain enamel for direction signs.

State and county maintenance officials wishing additional information on the new Pemco White may secure it by writing direct to the manufacturer and mentioning this news item.

Highway Research Board Meeting Is Cancelled

The Twenty-fourth Annual Meeting of the Highway Research Board, scheduled to be held November 22-25, at the Netherland Plaza Hotel, Cincinnati, Ohio, immediately preceding the meeting of the American Association of State Highway Officials at the same hotel, has

been cancelled at the request of the Office of Defense Transportation.

Maj. Comeaux Rejoins Explosives Institute

After two years in active service in the Office of the Chief of Ordnance, Major C. Stewart Comeaux has returned to civilian life and resumed his duties as Secretary-Treasurer of the Institute of Makers of Explosives and the Sporting Arms and Ammunition Manufacturers' Institute at 103 Park Ave., New York City.

Major Comeaux, a native of Louisi-

ana, has been a resident of New York since 1916. As a member of the Officers' Reserve, he was called to active duty at the outbreak of the present conflict. His latest assignment was that of Assistant Deputy Chief of the Field Service Division, Ordnance Department, Army Service Forces.

For the past thirty-one years Major Comeaux has been associated with the Institute of Makers of Explosives, which is composed of the leading manufacturers of commercial explosives and accessories in the United States.

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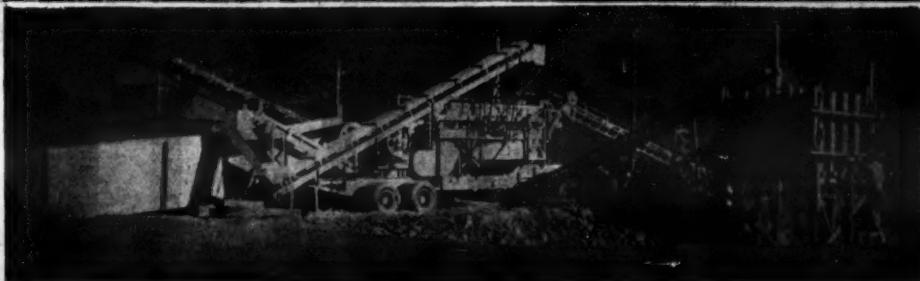
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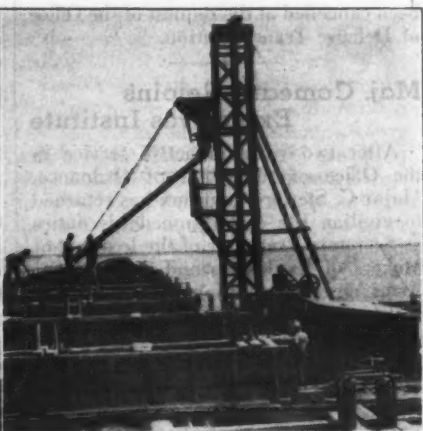
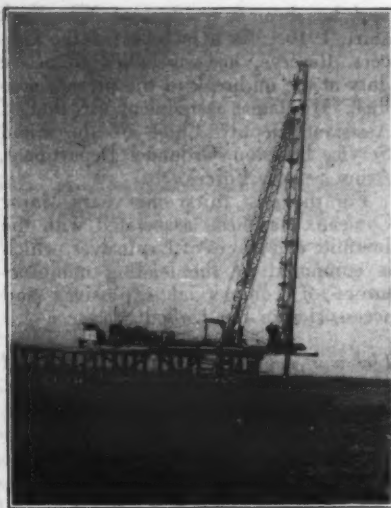
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KUBIT IMPACT BREAKERS





Floating equipment on the Lavaca Bay Bridge repair contract. At left, the steel pile-driving rig with 75-foot leads, and, above, the floating concrete plant.

Driving New Piling For Texas Causeway

(Continued from page 1)

One of the freakish results of the storm, revealed by the salvaging operations, was the presence of thirty-five or forty spans of practically undamaged slabs and stringers found resting, right side up, in 6 feet of water 50 feet north of the damaged bridge. It was found that, after 12 years of use, the old treated-timber piling, given a 24-pound full-cell pressure treatment prior to its driving in 1930, still bled when it was stockpiled in the material yard, awaiting re-use.

Piling

Untreated piles from 35 to 50 feet in length and 24-pound full-cell pressure-treated piles 32 feet long were shipped from Louisiana to Port Lavaca where they were spliced to form composite piles. A rack constructed of four bents of heavy timbers 60 x 100 feet in area was set up approximately 7 feet above the ground, with a platform between two of the bents from which workmen performed the splicing operations. The splice of a 32-foot treated pile to the upper end of an untreated pile, whose length ranged from 35 to 50 feet, was made by bolting four 8-foot pieces of 6 x 6-inch untreated timber across the splice, six 3/4-inch bolts fastening each pair of splice plates together. Bolt holes

A Koehring 303 crane handled piling onto the splicing platform and from it to the 20 x 80-foot wooden barge which transported twelve to sixteen piles per trip to the point where they were to be driven. A wooden skid rig mounting a 3,290-pound drop hammer in 70-foot leads started at the west end of the bridge and drove about 60 per cent of the piling. An Orr & Sembower gasoline-powered 2-drum hoist with a niggerhead winch operated this drop hammer.

As an aid to accurate pile driving and cap setting, fourteen observation stations were built, consisting of four piles, three forming a triangle around the fourth in its center and tied with 3 x 8-inch timber near their tops, on which was set a platform from which instrument men could give grade for the construction operations. Two of these were set on the center line of the bridge for giving line, with the balance 200 feet to the north of the center line to be safely out of the way of possible dropped piles or overturning pile drivers.

The 67 to 82-foot composite piles

ordinarily settled 20 feet into the mud by their own weight and another 15 or 20 feet under the weight of the hammer before driving became necessary, so that ten to sixteen piles were usually driven to a bearing of 8 to 9 tons during each 10-hour day.

The design of the new structure required a load-bearing capacity of 35 tons per bent of four piles. While the early driving indicated, under the ENR pile-bearing formula, a bearing of 10 to 12 tons per pile, there was a feeling that the piles were being damaged at the splice during driving. Several piles were driven in the usual manner and then pulled for inspection which showed damage to the tip of the treated piles at the splice and within a short distance above the splice. It was therefore decided to reduce the bearing resistance to 7 tons per pile which necessitated an additional pile per bent. This was done, giving five piles per bent.

During this period, load tests were applied and it was learned that pile

(Continued on next page)

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BUCYRUS, OHIO

TRAXCAVATOR

The Original Tractor Excavator

Caps and Stringers For 162 New Spans

(Continued from preceding page)

which showed a bearing capacity by formula of only 7 tons could be loaded to 18 tons with a net settlement of only 0.011 foot, and one tested to failure required a load of 33 tons to produce a settlement of 0.119 foot which was reduced to 0.101 foot upon removal of the load. As a result of the information obtained from the load tests, the use of the designed 4-pile bent was resumed.

To expedite completion, a second pile driver was placed in operation at the east end of the bridge and this full-circle-swing steel rig with 75-foot leads, using a No. 2 Vulcan single-acting steam hammer handled by a 3-drum Clyde hoist, powered by steam from a 40-hp vertical boiler, drove the remaining 40 per cent of the piling required.

The piles were cut off by four men using cross-cut saws, working from a barge, the tops were pulled into position by lines from the hoist, and the 6-inch-diameter treated-pole sway bracing was set at a rate to keep pace with the pile driving. An Ingersoll-Rand 110-cubic-foot compressor with an I-R air drill, mounted on the pile-driving rig, was used to bore holes for the sway bracing.

Forms for Concrete Caps

With the piling cut off to grade and sway bracing attached, the forms were set for the concrete caps. Six x 6-inch timbers were attached at proper grade along each side of the 4 or 5-pile bents, with 3/4-inch bolts joining them on each side of each pile. On these 6 x 6-inch supports the sections of cap bottom forms, made of 1-inch lumber on 2 x 4 framing, were set and they in turn supported the side and end cap forms made of 1 x 8-inch shiplap with 2 x 4 studs at 16-inch centers, plated top and bottom with 2 x 4's. Each cap side form consisted of two sections while the ends were in single pieces. The caps were 24 inches wide and 18 inches deep at their ends with the 1-inch crown increasing this depth to 19 inches at the centers. No ties were used through the cap forms which were firmly blocked at their bottoms and tied by cross struts at their tops.

Pouring of the concrete caps was done from the floating concrete plant which will be described under the deck-placing procedure, and was performed as rapidly as necessary to keep pace with the pile-driving operations.

Precast Concrete Stringers

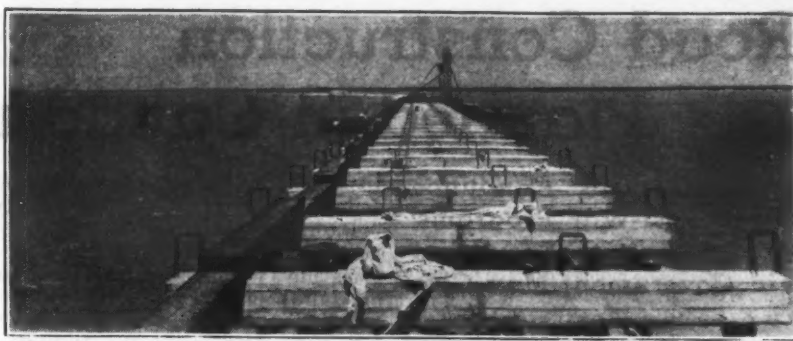
Since the number of salvaged stringers was insufficient to rebuild the bridge completely and timber of the required size was not obtainable, the design provided for the use of precast concrete stringers for 162 spans of the rebuilt bridge. These precast stringers are 8 x 15 inches in cross section with their upper corners notched 1 inch in depth and width to support the floor forms. Each stringer contains four 1-inch round steel rods set longitudinally, while nineteen 1/2-inch round shear stirrups were set to protrude from their tops to form

a tie with the floor system. U-shaped handling rings were also set 2 feet from the ends of the stringers, making a total of 250 pounds of steel reinforcement for each 17-foot stringer.

At the casting yard near the west end of the bridge, an area 100 x 200 feet was carefully leveled and 18-inch 2 x 4 stakes were driven to grade at 4-foot centers. Nailed to the tops of these stakes were flat 2 x 4's, parallel to the long dimension of the casting forms. On these rested the 1 x 8-inch box bottoms, with 1/2-inch chamfer strips marking the outlines of the stringers, and the side forms, made of 1 x 6 and 1 x 4 shiplap set endwise on 2 x 4 studs at 18-inch centers with 2 x 4 plates at top and bottom.

Four endwise rows, each row forming forty stringers, were set with runways for concrete carts between the first and second and the third and fourth rows.

Each nest of forty stringer forms was further separated into four sections of ten stringers, each to constitute the stringers for one span and poured in the



Completed bents with concrete caps in place on the Lavaca Bay Bridge, Texas. Note the tie-down loops for the precast concrete stringers.

same relative position they were to occupy in the finished structure, with the two outside stringers in each set of ten being provided with bolt holes through which the hand-rail posts would later be attached.

A Koehring 10-S mixer with a rubber-tired crossways frame was placed conveniently and fed by wheelbarrows weighed on a 3-beam Fairbanks scale.

Sand and gravel were trucked from Victoria, Texas, and Longhorn cement in cloth sacks came by rail from the San Antonio plant of the Republic Portland Cement Co. A mix containing 5 sacks per cubic yard with 6.6 gallons of water per sack of cement produced a 2 1/2-inch-slump concrete which a Mall vibrator worked into the heavily reinforced

(Continued on page 56)

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Road Construction Planned in Canada

Five Provinces Announce Large Post-War Programs; Others Wait to See What Aid Government May Give

By R. B. HAMILTON,
Toronto, Canada

(See photos on pages 48 and 49)

WITH five of her nine provinces so far committed to a total estimated expenditure of nearly \$650,000,000 for post-war highway work, the Dominion of Canada today merits more than usual attention from United States construction firms interested in extending their activities north of the border.

The five provinces which have thus declared themselves are British Columbia, Alberta, Saskatchewan, Ontario, and New Brunswick. They represent roughly half of Canada's land area and, with the exception of Ontario and New Brunswick, have the most scattered populations and least road development. The four remaining provinces which have yet to announce their post-war road plans, with the exception of Manitoba which is centrally located, comprise the eastern part of Canada and are the Dominion's oldest provinces. As such, they have the most established road systems in the country. Because of this, they present less opportunity for post-war road projects than do the western areas. Nevertheless, they too are known to be looking to road building as an important means of satisfying post-war employment requirements and for providing an outlet for their war-expanded construction and equipment-manufacturing industries. In these provinces, post-war road building will mean for the most part rehabilitation and modernization.

In eastern Canada, as in the United States, highway officials agree that the widening of existing concrete pavements and the resurfacing of damaged roadways are two of the most needed types of highway improvements. They base their thinking on the fact that during the war years road building has been more or less at a standstill and that the deteriorating effects of inadequate maintenance are to be found in almost every section of the country.

As yet there is no national post-war highway plan in Canada such as that drawn up for the United States by the American Road Builders' Association, calling for the expenditure of \$3,000,000,000 a year on state highway systems, metropolitan-area highways, city streets and county and local roads. For many months, however, post-war planning for roads and highways has been to the fore in the minds of officials directly and indirectly concerned with guiding the Dominion's reconstruction program.

Last November this planning gained impetus through an inter-provincial conference of highway officials which was held at Calgary, Alberta, under the auspices of the Canadian Good Roads Association. All nine provinces and the

Dominion government were represented and delegates were given an opportunity to learn what was proposed in each province, with a view to integrating local plans into a comprehensive program for the entire country.

Following the conference, provincial authorities interviewed the Dominion Cabinet to learn how much government aid, if any, the provinces could count on in the financing of their post-war highway plans. No assurances were forthcoming on this score, however, the Dominion taking the position that the matter was one to be handled by the yet-to-be-appointed Federal Ministry of Reconstruction.

The attitude of the Dominion authorities has been a big factor in the unwillingness of some of the provinces to

make known in detail what they plan in the way of highway development at the war's end. In this classification are Manitoba and the eastern provinces of Quebec, Prince Edward Island, and Nova Scotia.

Of the five remaining provinces, only one, Saskatchewan, has seen fit to reveal full construction details. Alberta is next with a comprehensive breakdown of projected mileages and costs but British Columbia, Ontario, and New Brunswick have limited their disclosures of post-war highway undertakings almost wholly to total estimated expenditures.

Saskatchewan Plans

Saskatchewan's post-war highway construction program calls for the expenditure of \$87,805,000 over a five-year period. This, says H. R. MacKenzie, Deputy Minister of Highways for Saskatchewan, is "in anticipation of the establishment of a national public works construction program".

Of this sum, \$33,255,000 will go for highways of inter-provincial and inter-

national importance, to finance the completion of hard surfacing on the 465 miles of Trans-Canada Highway which crosses Saskatchewan, completion of hard surfacing of the highway from North Portal on the international boundary to Prince Albert National Park, and the construction of an east-west hard-surfaced highway through the northern part of the province from the Manitoba-Saskatchewan boundary near Roblin, Manitoba, to Lloydminster, Saskatchewan.

The standards of construction proposed for these three projects are: width of right-of-way, 150 feet; maximum curvature, 5 degrees; maximum gradient, 7 per cent; crown width of embankment, 32 feet; side slopes, 4 to 1; average volume of excavation per mile, 25,000 cubic yards; sub-base, 6-inch plant-mix stabilized gravel; pavement, 3 inches of plant-mix bituminous-treated gravel 24 feet in width. These three projects, the total mileage for which is 1,330.2, are now improved to a lower standard

(Continued on page 36)

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CYCLES

Length	Weight
30 in. Pruner	25 lb.
30 in. Saw	1 1/2 lb.
72 in. Section	1 1/2 lb.
72 in. Section	1 1/2 lb.

This combination can be quickly and easily assembled to make either of these two tools:
1 Heavy Duty Tree Trimmer (21" capacity)
2 Back-sawing Pole Saw 14 1/2 ft.
If other lengths are required, specify extra sections 4 or 8 ft. long, to make the necessary length.

Motor-Grader Tire Production Slowed Up

The probability that tires for motor graders will be scarcer in the fourth quarter of the year was voiced at a meeting of the Motor Grader Manufacturers Industry Advisory Committee, according to an announcement from the Construction Machinery Division of the War Production Board. Production facilities for large-size tires are crowded to the limit, and this situation is further complicated by the fact that during the third quarter of the year orders for some 800,000 tires, in all sizes, could not be

placed.

It was recommended that orders for motor-grader tires be placed immediately and certified for fourth-quarter delivery.

A Foreign Division For American Firm

The International Harvester Co., Chicago 1, Ill., has announced the formation of a new Foreign Operations organization which will be in charge of all of the foreign activities of the company, except Canadian operations. This new Division will be headed by G. C. Hoyt

as Vice President, who heretofore has been Vice President in charge of foreign sales. C. N. King, former Manager of foreign sales, becomes Director of Foreign Operations in the new set-up.

A. M. Rode, formerly European comptroller and assistant treasurer of the company, has been appointed to the newly created position of Director General of European Operations, and J. L. Camp, formerly an executive of the International Harvester Co. Argentina, has been appointed Director General of Latin-American Operations.

Mr. King will be assisted by an executive staff of specialists, who will be

designated as managers of foreign manufacturing, sales, engineering, accounting, supply and inventory, merchandising services, and treasury. These executives will be located at the general offices in Chicago.

Wallace Heads Chicago PCA District Office

The Portland Cement Association has appointed W. Wayne Wallace as District Engineer in charge of its Chicago District Office, with headquarters at 33 W. Grand Ave. Mr. Wallace will have charge of Association activities in Illinois.

Power precedes production

Reiman Archive

Flour Mill — 16th Century

Production of Flour Mills in the 16th century was limited to the local power available.

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Modern Dump Trucks With Multiple Bodies

Where contractors find that it takes some time to load a dump-truck body by hand, or the loading sites are scattered and loading slow, they can make good use of the Brooks Load Luger which consists of several containers or buckets, and a hydraulic hoisting mechanism and frame mounted on a truck body. This device is designed to pick up a loaded bucket, place it on the truck for transport, and dump the load at its destination, returning the empty bucket to the point of loading where the truck picks

up another loaded container.

Catalog No. 44 recently issued by the Brooks Equipment & Mfg. Co., 2206 Davenport Road, Knoxville 8, Tenn., describes this system of multiple bodies for dump trucks in detail. Copies of this catalog will be sent free on request by the manufacturer to those who write and mention this review.

U. S. Army Manual on Tires Released for Civilian Use

A comprehensive manual on the design and construction of pneumatic tires which was published for U. S. Army

training schools by The B. F. Goodrich Co. is now available to civilians interested in the subject.

This illustrated 50-page manual discusses the basic principles of pneumatic-tire design, including pictured descriptions of the role which each part of the tire plays in its operation, and how tires are manufactured. Measurements and other data on each of the important classifications of heavy-duty military and civilian tires, and proposed load and inflation tables for them are one of the features of the publication, together with tube, valve, flap and rim data.

Copies of this manual may be ob-

tained by writing to The B. F. Goodrich Co., Akron, Ohio, and mentioning this item.

Rex Speed Prime Pumps Described in New Catalog

The Rex general-purpose self-priming centrifugal pumps manufactured by the Chain Belt Co. are described in detail in the new Bulletin No. 447. This 20-page illustrated catalog gives the features and uses of the different Rex models. Copies may be obtained by writing to Chain Belt Co., 1666 West Bruce St., Milwaukee 4, Wis.

Their business is to help keep your business going



Big, well-equipped service shops enable "Caterpillar" dealers to offer their customers the last word in maintenance and repair service.

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The War Production Board wants to locate usable track-type tractors, motor graders, cranes, shovels—vital needed by mining, logging, oil-field, agriculture and other industries. What can you do with yours? If you don't want to rent or sell? If you don't know where to contact your regional WPB officials, your "Caterpillar" dealer will gladly direct you and give you further details.

"CATERPILLAR" owners are fortunate in having a dependable service-dealer organization to which they can turn for expert inspection, adjustments and repair work at a time when obtaining new equipment is virtually out of the question—except for the most essential needs.

That your "Caterpillar" dealer is able to provide such services, despite the fact that his showrooms may be empty, is due to sensible long-range planning. His dealership has been established on the sound principle that doing business successfully is not alone a matter of making sales, but of keeping sold equipment in good operating condition—come what may.

During the long war years, your "Caterpillar" dealer has been steadily

on the job—geared to come through for you. In fact, his shop is likely better equipped to serve you than ever before, with more factory-trained service men, finer equipment and the latest methods to save time, money and war-critical materials in keeping your machines at work. His desire now, as always, is to make your business more profitable and he is equipped to make that wish come true.

Have your "Caterpillar" service-dealer go over your equipment now—for inspection, adjustments, and replacement or repair of worn parts. In this way, not only can your operating costs be kept at a minimum, but the life of the equipment can, most likely, be prolonged by thousands of hours.

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INSPECT Look your equipment over frequently. For expert "internal" inspection of operating parts or functions, call in a trained "Caterpillar" service man. Read your Operator's Instruction Book.

LUBRICATE Use the right oil at the right time in the right place and in the right quantity. Keep the oil clean—change before it becomes dirty and deteriorated. Follow the Operator's Instruction Book.

ADJUST Tighten all bolts. Keep fan belt and tracks at proper tension. Read the Operator's Instruction Book. For fuel injection valves and other precision adjustments, let your experienced service-dealer do the work.

REPLACE Have your service-dealer replace or repair worn bearings, track rollers, pins and bushings, sprockets, cylinder liners, clutch linings. His service helps restore power and extend equipment life. Saves critical materials, too.

**DEPENDABLE is the word
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Rolled-Concrete Work Of U. S. Engineer Corps

Syracuse District Office Completes Projects at Rome And Niagara Falls, N. Y., on Large Areas at Airfields

By THEODORE REED KENDALL,
Editor

Both contrasting and confirmatory experience was secured by the U. S. Engineer Department on contracts for large areas of rolled concrete for flight-hangar aprons at Niagara Falls, N. Y., and for runway shoulders and gutters at Rome, N. Y., using Vinsol-treated cement. The type of work, according to U. S. E. D. specifications, consists of a base course of a lean mix of portland cement, selected granular materials and water, proportioned and mixed in a central mixing plant, or in truck mixers, spread on the prepared subgrade by power graders and compacted by rolling to the maximum practicable density. Gradations of aggregates and proportions as well as details of placing and rolling the concrete will be covered in this article.

Work at Niagara Falls

The operation at Niagara Falls, N. Y., consisted of laying 56,000 square yards of apron for the flight hangars in rectangles measuring 75 x 130 feet, with the exception of a strip 25 feet wide adjacent to the hangars. The concrete was of 7-inch uniform thickness. At this project the subgrade was a heavy clay which would heave under frost action so 4 inches of crusher-run limestone was spread and rolled as a base for the rolled concrete. Steel road forms were set the full width of the rectangle being paved and grade stakes set to instrument on 12-foot centers both ways to guide the placing of the concrete.

On this work two grades of sand were used, one Lake Erie beach sand and the other Genesee River sand, in the proportion of 50 per cent of the finer Lake Erie sand and 50 per cent of the river sand. The sieve analysis of the mixed sand for an average run of twelve samples taken at different intervals gave the following percentages, which were within the specified percentages shown in the third column of the table:

Sieve	Per Cent Passing	Specification
No. 4	96.2	95-100
No. 8	81.9	
No. 16	67.0	45-80
No. 28	52.9	
No. 50	27.7	15-30
No. 100	3.9	4-10

The coarse aggregate, a crushed limestone furnished by the Buffalo Crushed Stone Co., Inc., was a combination of New York State sizes No. 3A, No. 2, and No. 1, made up of 50, 25 and 25 per cent respectively.

The gradation of the combined sizes was as follows:

Sieve	Per Cent Retained
2-inch	0.0
1½-inch	14.6
1-inch	49.9
¾-inch	32.0
½-inch	75.7
¼-inch	90.7
No. 4	99.2

The weight of the stone ran 99 pounds per cubic foot with 41.1 per cent voids.

The concrete mix was designed with 60 per cent of the sand mix, 40 per cent crushed stone, 4 bags of Federal-specification Vinsol-treated cement per cubic yard, 7 per cent moisture, and a zero slump.

The concrete was batched off the reservation and hauled to the site by a fleet of fourteen 4 and 6-cubic-yard truck mixers. The truck mixers delivered the mix direct to the subgrade between the forms and it was spread at once by an 8-wheel-drive Austin-Western power grader to 1½ inches above the

elevation shown by the grade stakes to allow for compaction by a 10-ton Buffalo-Springfield tandem roller. The tandem was run until there was very little imprint of the edge of the rolls left as they passed over the concrete. Then the surface was given a light fogging of water to make up for the evaporation from the surface and a 5-ton Bros 5-wheel pneumatic balloon-tire roller was pulled over the surface by a rubber-tire tractor to provide a kneading action on the surface to seal the pores.

All tests of the completed job were above the specified strengths. Six-inch cores showed 2,285 and 2,500 pounds per square inch and anchors for the tie-downs all withstood the required 5,000 pounds vertical pull. Only one showed any haircracks.

Methods at Rome

At Rome, N. Y., the rolled concrete was used for the gutters along the runways, with varying amounts of cement to test the economy of the method. The gutters are 30 feet wide and 6 inches uniform thickness on either side of the 150-foot runways, sloping on a 1 per cent grade from the runway for 20 feet and then rising on a 2 per cent grade for the remaining 10 feet. Drainage inlets were inserted at the bottom of the gutter every 250 feet. These gutters are especially valuable as snow storage areas in this district of heavy snowfall. The snow is plowed off the gutter to just beyond the inlets to permit as rapid drainage from the runways as possible.

Run-of-bank gravel was used at Rome where it passed the specified gradations. Two sources of gravel were required because the pit-run material at one was slightly coarse and the other fine, but together they met the specifications satisfactorily. The gradation of the combined coarse and fine material from the two sources was as follows:

PER CENT RETAINED—COARSE MATERIAL

Screen	Jenney Pit	Cooney Pit	Combined
2-inch	4.1	3.0	0.9*
1½-inch	9.7	9.0	4.2
1-inch	35.7	31.0	14.7
¾-inch	54.0	46.6	22.0
½-inch	73.1	65.5	30.5
¼-inch	82.0	75.6	34.9
No. 4	100.0	100.0	45.0

PER CENT RETAINED—FINE MATERIAL

Screen	Jenney Pit	Cooney Pit	Combined
No. 8	12.2	21.1	33.2*
No. 16	24.4	37.3	60.8
No. 28	56.3	59.1	76.3
No. 48	84.8	76.3	91.0
No. 100	90.3	83.6	94.4
No. 200	91.8	90.6	96.3
Pan	100.0	100.0	100.0

*The figures for the combined materials as used have the percentages based on the sample considered as a unit and not divided into coarse and fine materials.

In designing the mix for the work at Rome, a minimum cement factor of 3½ sacks per cubic yard was used at the start, based on the volume of the concrete as compacted in place. This was used for half of one side of a runway and then increased to 3½ sacks and finally to 4 sacks which raised the strength of the concrete but did not improve the appearance of the surface

(Concluded on page 69)



BRIDGING THE GAP to Peacetime Jobs... American Road Builders' Plan points way

Every day brings us closer to a most important war-time problem, i.e., peacetime jobs for the boys who are winning the war.

The American Road Builders' Association has submitted a comprehensive plan for post-war roads and jobs. It calls for construction of needed new highways and improvement of the present United States highway system, including bridges and grade crossings. It would create jobs for millions of men.

3,000,000 jobs on highway construction alone. Millions of other jobs making and supplying ma-

chinery and materials. Jobs all over the country. Jobs that would pay good wages. Jobs that would greatly improve the America we love.

There's an inspiring 64-page booklet, "A SOUND PLAN FOR POST-WAR ROADS AND JOBS," prepared by the Association. Get a copy today. Write for it to The American Road Builders' Association, 1319 F St. N.W., Washington 4, D. C.

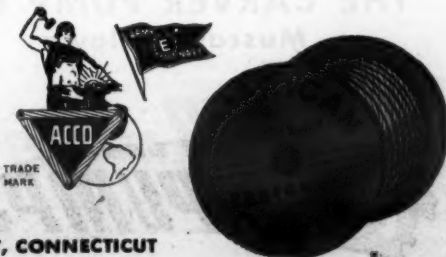
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New Honduran Road Steps Up Commerce

Towns and villages in one of the richest regions of Honduras, many of them connected with the trade centers only by horse trails, are stirring to a new economic life as the result of an inter-American project, now completed, involving the construction of a 40-mile highway to fill the last gap in a rail-highway route from the east to the west coast of this Central American republic. The road connects Potrerillos and Pito Solo on Lake Yojoa. Out of Potrerillos, its route is through lowland swamps and tropical jungle for 10 miles. It then ascends to the highlands to follow for nearly 30 miles the shores of the lake.

The incomplete 40-mile stretch formerly made inter-coastal traffic difficult, seasonal and expensive. For lack of a road around Lake Yojoa, trucks were ferried across the waterway, and the passage from the lake to Potrerillos, when open, had to be traveled in low gear and with considerable wear on tires.

Construction of the Potrerillos-Pito Solo road was financed through the Institute of Inter-American Affairs, an agency of the Office of the Coordinator of Inter-American Affairs, Washington, D. C. One objective was to give work to displaced banana workers during an emergency period. For a while employment rose to as high as 1,800 on the road, pending conversion of production in the country to strategic materials. The project also has helped to speed production and transportation of strategic materials needed by the United Nations.

New Slide Rule Spots The Decimal Point!

Some three hundred years ago the slide rule was invented and ever since that date engineers and other computers have floundered around looking for some simple positive mechanical method of placing the decimal point. Pickett & Eckel, 53 West Jackson Blvd., Chicago

4, Ill., in developing a simple nomogram to teach youngsters the use of slide-rule scales, developed the Computogram. In rearranging the logarithmic scales on the Computogram, it was found that a simple three-line nomogram spotting the digits and zeros in the numerator and denominator on the outside lines would enable anyone to read off the number of digits or zeros in the result on the center line without computation.

This discovery led to the belief that the principles involved might be applied in the development of the slide-rule decimal-point locator. The new moderately priced slide rule determines the decimal point mechanically in involved expressions with results up to 19 digits or 19 zeros. It obtains a 30-inch scale accuracy for cube root and 20-inch scale accuracy for square root on a rule with 10-inch scales. With one setting of the hairline it is possible to read square root, cube root and logarithm and similarly, with one setting of the hairline, determine the number of digits or zeros

in the square root or cube root. This slide rule simplifies calculations so that persons with very limited mechanical background can evaluate and point off relatively complicated expressions.

The Decimal Point Locator and Slide Rule is 11 inches long, 2 inches wide and 1/4 inch thick, constructed of Sorex tag lithographed, varnished and bonded. Complete information regarding this new mathematical aid may be secured direct from the manufacturer by mentioning this item.

Eastern Sales Office And Plant Combine

The eastern sales office of I. F. Laucks, Inc., of Seattle, Wash., is now combined with the laboratories and plant of the company at Lockport, N. Y. This change applies to both the glue and Laucks coatings and wood preservatives sales, and was made in order to bring the technical service department into closer touch with the sales activity of the company.



... Save You Money

LOW first cost, fast priming, efficient, non-clogging action mean that Carver Pumps get to work faster, stay on the job longer, and pump more water at less cost per gallon. Top capacity is maintained even after hundreds of hours of toughest service because the wearing surface seal rings are made of Tungsten Carbide that will keep water in and air out, for the life of the pump.

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THE CARVER PUMP CO.
Muscatine, Iowa



Modern Cycle of HIGH SPEED Rock Handling



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Every connecting rod, in every Wisconsin Air-Cooled Engine, is precision-balanced to eliminate all weight variations in excess of 1/4-ounce per rod. This is admittedly cutting it pretty fine for a rough-and-ready heavy-duty engine... but not too fine for these fine engines. Smooth operation, reduction of vibration to a negligible minimum, prevention of excessive wear... these are factors that can be controlled only by the most meticulous care and attention to such small details as this.

The value of this attention comes into play when a Wisconsin Air-Cooled Engine powers your equipment.

Most
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pound

WISCONSIN MOTOR
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MILWAUKEE 14, WISCONSIN, U. S. A.
World's Largest Builders of Heavy-Duty Air-Cooled Engines



Soil Mechanics Aids Economies in Design

Examples of Savings Made Possible by Soils Studies Before Design and Letting Of Contracts; Fundamentals

By PHILIP KEENE, Soil Mechanics Engineer, Connecticut State Highway Department

IN the last decade, highway work has become "big business". Highway systems have expanded, existing roads have been improved, cuts and fills are larger, pavements are smoother, grade crossings are fewer—all in the interest of more and better highways. Helping to make this possible is the new science of soil mechanics. This science deals with the engineering properties of soils and their application to engineering projects. It is a combination of soil physics, engineering mechanics, and mathematics, and always should be tempered with a large dose of practical judgement. Many of the phenomena with which soil mechanics deals have been known from experience by contractors and engineers for many years. Soil mechanics gives a numerical answer, more or less accurate, to those problems which formerly could be answered only in a general or qualitative way.

Today the majority of the states have added soils engineers to their organizations, due to the recent realization that highway pavements are no better than the soil foundations beneath them and that stable roadbeds, proper drainage, stable slopes and similar features can be correctly designed and constructed when they are scientifically analyzed. Several states have also realized that, in the past, bridge foundations have been designed without a scientific knowledge of the properties of the soil beneath them, often resulting in excessive costs and delays in completion, with consequent inconvenience and loss of time to the traveling public. An active and well-trained soil mechanics engineer with a few aides can easily save a state \$50,000 to \$100,000 or more per year, depending on the volume of construction and maintenance and the soil conditions.

Most soil mechanics problems are concerned with the movement of water in the soil pores: expulsion by pressure of a load, seepage of ground water, capillary rise (particularly in fine-grained soils), saturation by rainfall, and other phenomena. In highway work, soil mechanics is used in the two main branches of highway engineering: bridges and other structures, and roadways.

Bridge Foundation Problems

For bridges and other structures, the most common use of this science is to obtain bearing values of soil for foundations. Bearing value is governed, not by the ultimate strength to resist complete failure, but by the amounts of settlements that can be tolerated. Unless the soil is very soft, the bridge load can be spread over it by the use of wide footings, thus saving the expensive item of driving piles to hard soil or rock below. But if the resulting settlements are large and uneven, the bridge will crack badly and must be given major repairs or even be rebuilt; this is failure in a practical sense.

To anticipate such failures, samples of the foundation soil are tested in a consolidation machine, to obtain stress-strain curves for various loads and time-strain curves for each load increment. Thus we know how much and how fast a soil will consolidate under the loads imposed by building the bridge and can make a safe and economical design. The

major portion of such consolidation follows the theory of consolidation, which is solved mathematically by the use of a Fourier series, similar to that used in the case of a semi-infinite plate which is slowly cooling. In simple language, the load squeezes the soil particles closer together and a corresponding amount of pore water is squeezed out. It is like squeezing a very dense, saturated sponge or piece of cotton.

The stress distribution through the soil due to these loads is obtained from solutions by Boussinesq, Carothers, Westergaard and others, derived from the theories of elasticity. Judgement factors are introduced by the soils engineer, as the soil is never truly the ideal elastic body of semi-infinite extent assumed when obtaining a solution by an

elasticity formula. Rates of settlement are fast or slow, depending on the size of the soil pores and the distance to layers of gravel or other free-draining material to which the expelled water may escape. Gravels and sands settle almost instantly, but clays settle slowly, as water can travel through the submicroscopic clay voids at an extremely slow rate.

An unusual case is a bridge carrying a wide divided-lane parkway over a wide street in East Hartford, Conn. There the bridge foundations are on 13 feet of coarse sand, overlying 140 feet of medium clay. At the end of two years, the bridge had settled 2 inches, slightly less than predicted, and probably will settle $\frac{1}{2}$ inch more in another four years. This settlement prediction was also of importance due to the minimum clearance required over the railroad track that runs on the street below, and because of the prediction, a large and expensive pile foundation was eliminated.

A nearby bridge, built many years ago over a small river, rests on 110-foot piles which were driven at great expense

and caused much delay and inconvenience to the project and the public. If soil mechanics, including undisturbed soil sampling, had then been available, the piles probably would have been found unnecessary.

Other Bridge Problems

A common need for predicting settlements is due to the development of continuous girders and trusses in modern bridge design. Differential settlements of abutments and piers may result in large secondary stresses in the spans. A good example is a bridge carrying a parkway over a future boulevard in Wethersfield, Conn. The pier is on piles because of a large sewer running under it, but the abutments rest on the soil, a rather firm red clay. Calculations from consolidation tests on undisturbed samples indicated that settlement of the abutments after the continuous girders were erected would be about an inch, which would cause small increases in stress in these girders. The actual settlements

(Continued on page 40)



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*Tru-Traction**

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Tru-Traction principle—Controlled Differential Steering—patented and used exclusively for years by Cletrac, you cannot wisely judge the value of any tractor. An easily understood book—Cletrac Controlled Differential Steering—explains Cletrac Tru-Traction in detail. Send for a copy and study it thoroughly before you purchase your next tractor.

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THE CLEVELAND TRACTOR COMPANY • CLEVELAND 17, OHIO

CLETRAC Tru-Traction TRACTORS



Advice to Counties On Post-War Plans

(Continued from page 2)

ties, for example, engineers are able to obtain rights-of-way 100 feet wide free simply by pointing out to the land owners the advantages to them, individually, of well built year-round roads leading right to their doors. Today's farmer recognizes his dependence on motor transportation and when he understands that a 100-foot right-of-way often permits construction of a road that will not be blocked with packed snow drifts during the winter months, he is usually pleased to cooperate.

Long-Range Planning

In selecting projects for post-war construction and in obtaining rights-of-way, the engineer's point of view must be long-range. It is one thing to embark on the WPA type of made work, simply to keep men busy, and another to plan those projects for immediate construction which fit into the broad picture of future highway developments and needs.

Typical of the lack of planning which was so preeminent in counties a decade or two ago are the abruptly ending "stub" roads whose original utility has been lost in the rapid development of motor vehicles. Lack of foresight is evidenced, too, in the extremely narrow rights-of-way which, until only a few years ago, seemed to plague county highway systems everywhere. Today's county engineer may avoid repeating the mistakes of his predecessors if, while he builds for today, he plans for tomorrow.

Stage Construction Advisable

Although it is difficult to anticipate specifically the post-war trend in motor transportation, it is safe to assume a mounting demand for good roads to meet an increased use of automobiles. The county highway engineer need not concern himself so much with the planning of super-highways as with the provision of good roads suited to the present and immediate-future traffic needs.

The engineer who plans for tomorrow will draw his plans and specifications for highways which may be built by stage construction. Thus, the first stage may be merely the grading of a wide roadbed within an adequate right-of-way and the gravel surfacing of a 30 or 32-foot roadway. As the use of the highway develops, it is then possible, with a minimum of reconstruction, to extend the highway surface over the full shoulder-to-shoulder width and to apply black-top or some other form of hard surfacing.

Plan for Equipment Needs

It is not so difficult for the engineer to anticipate now the equipment which the county will need, both in the immediate post-war years when there still may be shortages of machines, and during the years beyond when the country has more nearly returned to normal production and consumption. The demand for new road machinery is sure to be great.

Take stock, take inventory now! It is not hard to predict, on the basis of the new work which is planned, what the construction and maintenance equipment requirements will be. If you as an engineer will notify your equipment distributor before the end of the war of the number of machines which you probably will need during a period of from three to five years after peace, he in turn will be able to inform his manufacturers of the probable demand in his area. If you do this now, your order will be filled much more rapidly when it is placed.

There is certain to be some lag between the period when county highway construction is undertaken and the period when new machines will be generally available. To cope with this, the

highway engineer must continue to exercise the typically American ingenuity and mechanical genius which have kept worn-out equipment working through the war. It will mean increased concentration on equipment maintenance and breakdown prevention because, with the war over, the first order of the day will be an immediate and continuing public works program demanding a tremendous volume of construction equipment.

While new equipment may not be available, the supply of replacement parts and units for repair will, fortunately, be generous. Wire rope, for example, will be available to the consumer in

ample quantities again. During the war, although wire rope has been used extensively by the Army and Navy, the user on the home front has been able to carry on by using such wire rope as he had on hand when the war cut off the civilian supply. Fortunate was the user whose supply consisted of preformed wire rope which is manufactured to give longer service without replacement and to stand harder usage without breakage. Its long life has kept many shovels and scrapers working during this period of war.

Do Your Part

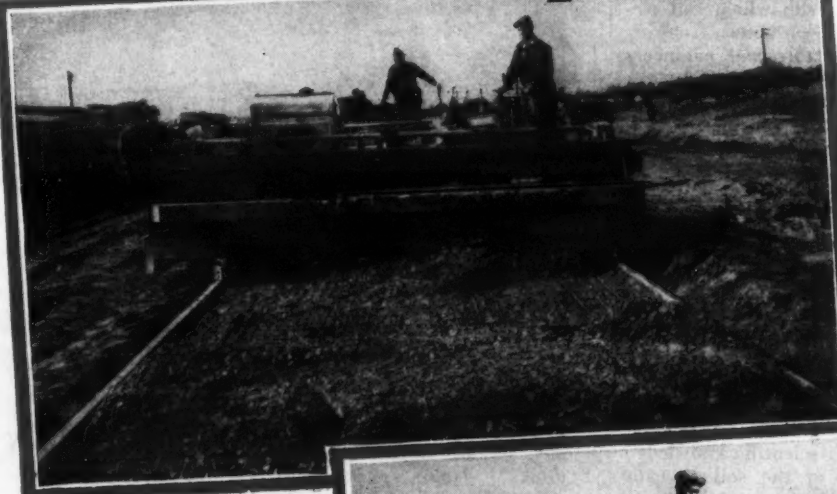
We are on the home stretch on the

world's battlefronts. When millions of men are finally mustered out of service and additional thousands are released from work in war plants, much of the employment slack must be taken up by a public works program. Counties will contribute most, not only to the residents of the county, but to the state-wide and nation-wide economic situation if they are ready and set-to-go with county road-construction projects. Definite county post-war planning with completed contract drawings will provide the means of immediate and adequate construction programs all over this land when the war is won.

Force-

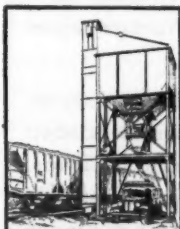
The loader, a in ditch ing and folder j Truss W cago 38, tool to the loader floating and low wide pic and is c

Use this up-to-dae



View behind Blaw-Knox Spreader-Vibrator shown in upper photograph. Concrete has been spread to required elevation and simultaneously compacted by vibratory attachment. Note uniformly smooth surface behind vibrator. Blaw-Knox Finishing Machine worked closely behind Spreader-Vibrator and kept pace easily. Cores drilled from completed pavement showed no honeycomb at bottom of slab or at joints and no excess mortar at surface of pavement.

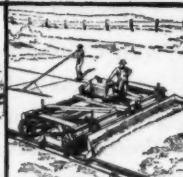
Dry, harsh, compaving mix being hand Blaw-Knox Transverse Auto-matic Type Con Paving Spreader equip vibratory attachment concrete tested 1/2 to 3/4 slump. Contractor's p in spite of diffic concrete was in excess of lineal ft. of 12 ft. wide slat per hour. Spreader or is one tion in increased streng concrete by 25 per cent.



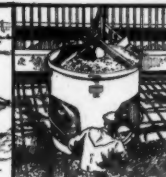
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PAVING SPREADERS FOR AIRPORTS AND ROADS



FINISHING MACHINES FOR AIRPORTS AND ROADS



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CLAMSHELL BUCKETS



AGGREGATE BATCHING PLANTS



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ARIZONA
Phoenix — State Tractor Equipment Co.
ARKANSAS
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San Francisco — E. M. Orsini
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Denver — Ray Corson Machinery Co.
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Force-Feed Loader Used In Road Maintenance

The use of the Athey Force-Feed loader, a one-man-operated loading unit, in ditch cleaning, grading, road widening and similar work is described in a folder just received from the Athey Truss Wheel Co., 5631 W. 65th St., Chicago 38, Ill. Designated as a companion tool to the Caterpillar motor grader, this loader features a specially-designed floating feeder for quickly picking up and loading windrowed materials, a wide pick-up for big loading production, and is of heavy-duty construction with

ball and tapered bearings. It has eight working speeds, and a loading capacity up to 5 cubic yards per minute.

Copies of the folder describing the use of this Athey loader as a highway-maintenance tool may be secured by writing to the manufacturer for Form 441. Just mention this review.

Asphalt Institute Opens New Offices in Northwest

New District Offices to cover the northern California, Oregon and western Washington territory, located at 301 Wilcox Building, Portland, Ore., and

1304 Fourth Ave., Seattle, Wash., have been announced by The Asphalt Institute. W. A. Bugge has been appointed District Engineer in charge.

Mr. Bugge's engineering career started 22 years ago in the Washington State Department of Highways, and has included long service as County Road Engineer of Jefferson County, Wash., and four years as City Engineer of Port Townsend, Wash. He has also been President of the Washington State Association of County Engineers.

From his new offices, Mr. Bugge will extend the engineering, research, and promotional facilities of The Asphalt In-

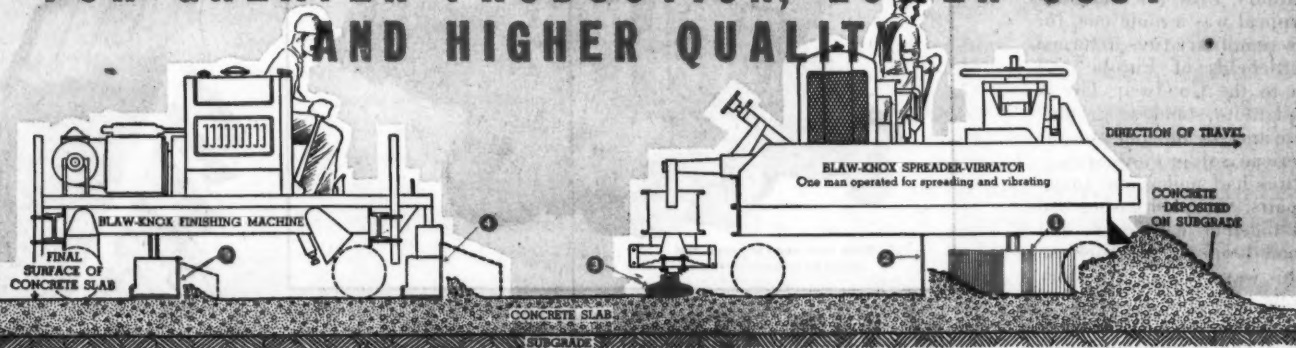
stitute to highway engineers and officials of Federal, state, municipal, county, and town agencies. Free literature about asphalt may be obtained from these new offices.

Secretary of Richmond Screw Anchor Co. Resigns

Charles A. Snyder, President of the Richmond Screw Anchor Co., has announced the resignation of Martin E. Flaherty as Secretary and District Sales Manager as of July 6, 1944. Mr. Flaherty maintains his interest as a stockholder in the company.

paving method

FOR GREATER PRODUCTION, LOWER COST AND HIGHER QUALITY



1 Automatic Transverse Spreading Blade spreads concrete transversely and at the same time pushes excess concrete ahead of machine; adjustable for spreading height.

2 Strike-off shapes concrete to required height and crown allowing slight excess for compaction by vibrator; strike-off is hydraulically adjustable for elevation.

3 Vibratory attachment compacts concrete simultaneously with spreading operation; vibrator is spring suspended and does not rest on side forms. All vibratory effect is transmitted directly to the concrete. Vibrator is controlled by spreader operator and leaves slight excess of concrete for finishing machine.

4 Finishing Machine front screed strikes off excess of concrete to exact grade and crown. Finisher has easy and rapid operation; follows close behind Spreader-Vibrator.

5 Rear screed of Finishing Machine performs final finishing and smoothing operation.

The method of paving construction illustrated has been proved on hundreds of miles of concrete paving construction for roads and airports.

The dry and harsh concrete mixes frequently specified by engineers for modern pavements can be spread, compacted and surfaced most rapidly and efficiently by the combination of the Blaw-Knox Transverse-Blade Type Automatic Concrete Paving Spreader equipped with vibratory attachment and the modern Blaw-Knox Finishing Machine.

The Spreader-Vibrator spreads the concrete to the required depth and at the same time compacts the concrete by vibration. The Finishing Machine follows close on the heels of the Spreader-Vibrator and does a quick and easy surfacing job. The Blaw-Knox Spreader-Vibrator teamed with the Blaw-Knox Finishing Machine handles the output of two 34-E dual drum paving mixers.

Difficult concrete is easily handled on a production basis by this up-to-date paving method and the contractor gains—in greater yardage, lower construction cost, minimum of manual operations and higher quality paving.

The Blaw-Knox Finishing Machine can also be equipped with a vibratory attachment. However, experience has shown that the paving vibrator mounted on the spreader provides better compaction, more practical operating procedure, and maximum production of paving slab. The Spreader-Vibrator always remains with the paving mixer and does not have to move back to aid in correction of high or low areas.

Blaw-Knox Spreaders and Finishers including vibratory attachments are available in standard sizes as follows: 10-15 ft. adjustable width, 20-25 ft. adjustable width.

Your Nearest Blaw-Knox Distributor Will Promptly and Efficiently Handle Your Inquiries for Construction Equipment.

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Toronto — W. L. Ballentine Co.

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NEW FOUNDLAND
St. John's — Dominion Distributors Co.



"Wounded veterans" of the North African and Italian campaigns. In addition to the ordinary hazards of rough, rocky roads, these Goodyear tires were exposed to machine gun and shell fire, land mines and other destructive war weapons.

How Tires Wear Out At the War Fronts

Recently a group of battle-worn veterans made a unique appeal to the tire builders of Akron where 65 per cent of America's military tires are manufactured. This appeal was a mute one, for the veterans were military tires, returned from the battlefields of Europe and North Africa to the Goodyear Tire & Rubber Co. plant to stand as graphic and pathetic witnesses of some of the trials of American soldiers overseas.

All these tires had undergone rough and ready repairs. Shrapnel gashes had been stitched together with cord, and torn treads had been riveted back on with bolts. This way of telling the story of the desperate makeshift devices employed by our fighting men to keep the tires rolling just a little longer was carried to the men and women who must step up the production of military tires, which has lagged behind schedule. Goodyear officials are confident that the tale will be heeded.

Du Pont Promotions

A series of promotions affecting the Explosives Department of E. I. du Pont de Nemours & Co., Wilmington, Del., has been announced by the company. Edward B. Yancey, former General Manager, has been elected a Vice President and member of the Executive Committee; J. H. Wellford, who was General

Manager; W. H. Ward has succeeded Mr. Yancey as General Manager, and H. F. Brown, formerly General Superintendent, succeeds to the position of Assistant General Manager; P. J. Kimball, Manager of the Explosives Division for almost four years, has been made General Superintendent; and F. R. Wilson moves up from Director of Production, Explosives Division, to Mr. Kimball's former position of Manager of the Division. T. R. Carlson succeeds Mr. Wilson as Director of Production of the Explosives Division.

Clean Metal Bodies Before Repainting

A much better paint job can be done on metal truck bodies and metal signs if the paint is entirely removed before new paint is applied. A paint stripper prepared especially for surfaces treated with zinc is being made by H. L. Perkins Chemical Co., P. O. Box 1636, Memphis, Tenn. This Kleenzall paint stripper is

made up as a hot-water solution with 1/4 pound of the chemical per gallon of water.

The manufacturer reports that the hot-water solution automatically remains adjusted at all times to maximum efficiency as long as there is 1/4 pound of the chemical to the gallon. All that is necessary to maintain fast cutting action is to add more stripper whenever the stripping speed slows down below that which is obtained with a freshly made hot solution. The stripper completely disintegrates the old paint so that it settles in a compact sludge which can easily be drawn off periodically.

It is reported that it is possible to strip the paint 500 times from sheet metal which has a zinc plating 0.0005 inch thick before a renewal of the zinc coating is necessary, because of the slow action of the chemical on zinc.

Complete information regarding Kleenzall paint stripper together with prices may be secured direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.



Body with open or scoop end (Right) Same body elevated.

**X-112 BODIES
and
T-4440 HOISTS**

**for
OPEN PIT MINING**



Body with automatic downfold tailgate.

SPECIFICATIONS

HOIST—Hydraulic, twin cylinder, telescopic.

PUMP—Gear type with aluminum wear-plates.

POWER-TAKEOFF—2-gear single speed.

BODY—Heavy duty with pressed-steel, box-type side braces and cross members.

BODY SHELL—1/4" sheet steel with 2" wood filler.

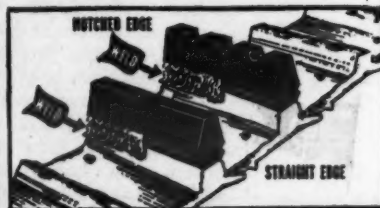
WEARPLATE—1/4" with floor angles or 5/16" without. Longitudinals 8-inch "H" beams.

CAB SHIELD—1/4" plate.

FLOOR ANGLES—Optional.

Fleets of Trucks, equipped with Gar Wood X-112 Bodies and T-4440 Hydraulic Hoists, are hauling the biggest loads ever moved by trucks on production schedules. Lower mining costs have been made possible by speeding up the handling of overburden, ore and coal.

Automatic gate opens as body elevates.



Easily Welded

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Trak-Link Re-Nu Plates
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WORLD'S LARGEST MANUFACTURERS OF TRUCK AND TRAILER EQUIPMENT

Montana Snow Fleet Works in High Passes

Snow-Removal Problem Is Complicated by Shifting Mountain Winds and Grades; Sand Storage Houses Used

(Photos on pages 1 and 88)

WITH fourteen mountain passes, at elevations of from 6,000 to 7,000 feet, on the main highway system, the snow-removal problem of the Montana State Highway Commission becomes not so much a matter of advance organization at specific locations as of the ability to shift forces rapidly to critical points. Snow removal, like other maintenance operations, is handled from ten district offices located at Butte, Great Falls, Billings, Wolf Point, Missoula, Kalispell, Havre, Miles City, Lewiston and Bozeman, with perhaps slightly more detailed control from the central office in Helena because of the need to shift men and equipment from district to district as the circumstances indicate.

The ordinary snow-plowing section consists of approximately 40 miles of road but in some instances where the snowfall is invariably heavy the lengths are reduced materially. The snow-removal equipment is stored in the district garages and in strategically located section houses at critical points remote from the district offices. The fleet is made up of:

- One-Way Plows
 - 2 LaPlant-Choute
 - 73 Bros
 - 31 Union Iron
 - 11 American
 - 3 Shop-Built
- One-Way-Reverse Plows
 - 1 Wisconsin
 - 3 Austin-Western
 - 2 American
 - 6 Baker
 - 13 Union Iron
 - 16 Ross
 - 3 Anthony
- Heavy V-Plows
 - 3 Baker
 - 29 Wausau
 - 7 North Star
 - 4 Frink
 - 5 American
 - 6 Bros
 - 2 Ross
 - 1 Shop-Built
- Rotary Plows
 - 1 Snow King
 - 3 Rotoblade
 - 8 Snogo
- Wing Attachments
 - 27 Wausau
 - 28 North Star
 - 3 Frink
 - 2 American
 - 2 Wisconsin
 - 6 Bros
 - 6 Ross
 - 1 Shop-Built
- Sand Spreaders
 - 8 Butler
 - 11 Shop-Built

Trucks to handle the snow-removal equipment range in size from 1½-ton

Fords and Chevrolets to 7½-ton FWD's, Colemans and Oshkosh's, some with special four-wheel drives. More than enough trucks are available to furnish replacements for those temporarily out of service.

In the autumn a master map is prepared, showing the location and proposed use of each piece of equipment available. After checking and revision in the central office, this map becomes the fundamental basis for operations. However, no pre-conceived plan will work at all times with the varied conditions existent in Montana, and equipment is shifted from section to section in the district by the district engineer or from district to district by the central office as a particular emergency requires.



A Snogo working on U. S. 10 in Montana about 7 miles east of the Idaho line.

The special section houses located in critical areas, remote from towns but close to areas of recurrent trouble, are two-story buildings with housing for

three or more units on the ground level and family living quarters for the section man on the second floor. Telephone (Continued on page 76)

Help Accomplish the Mission!

Roaring defiance, bombers and escort fighters break the Pacific silence as they take off for the next objective. Below are the men with their machines who carved out the base that made this mission possible . . . who even now plan to follow up the bombers with another invasion thrust.

It takes hands and hearts of steel to beat back a swamp-laden jungle, infested with every type of reptile and disease carrying agent . . . to withstand unbearable heat and gnawing homesickness. As one Seabee said, "People back home cannot by any stretch of the imagination realize the tremendous

amount of hard work that must be done before the smallest effort can be exerted against the enemy."

Courage and determination to see the job finished . . . modern, fast-moving tractors operating bulldozers, giant-sized scrapers and other grading equipment are the fighting tools of our construction battalions. A winning combination . . . and one that deserves the backing of every last one of us!

While they give all, we can give a little! Let's keep on buying War Bonds, Donate Our Blood, Conserve Food, Salvage Scrap and do the other small things asked of us. Let's help accomplish the mission!



ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, WIS.

BACK THE ATTACK . . .
BUY MORE WAR BONDS THAN BEFORE!

THE STRONGEST GEARED POWER FOR ITS WEIGHT IN THE WORLD

BEEBE BROS.
ALL STEEL HAND HOIST
SEATTLE, U.S.A.

Compact—Powerful—Safe
STANDING ROOM ONLY
FOR DURATION

Beebe Bros. All-Steel Hand Hoists carry the highest resale value of any piece of equipment in the world. If you have one not in use, sell it. Many more than are available are urgently needed in the win-the-war program. Thanks.

BEEBE BROS.
2724 6th Ave., So., Seattle 4, Wash.

New War Memorials For Our Roadsides

An appeal has been sent out by H. J. Neale, Chairman, Committee on Roadside Development of the Highway Research Board, for information regarding types of war memorials adaptable to highway roadsides. This is one of the subjects which had been planned for discussion by the Committee at the 1944 meeting of the Highway Research Board, which has been cancelled.

In order to cover this subject fully, the Committee is desirous of obtaining as much factual data as possible. This should include photographs of existing war memorials, together with plans, sketches, and other pertinent data. Special emphasis, however, should be given to memorials that would be adaptable to roadsides or waysides, and not those for city or town locations.

Anyone having any data on this subject, or any suggestions, is urgently requested to communicate with George B. Gordon, Associate Landscape Architect,

Public Roads Administration, Washington 25, D. C., who is collecting data for the Committee and will prepare a presentation of the subject for discussion at the next meeting of the Committee.

Bailey Bridge Produced By Virginia Bridge Co.

With the relaxing of strict military censorship, it has been announced that the Roanoke plant of the Virginia Bridge Co., a subsidiary of United States Steel Corp., has been engaged in the production of prefabricated units of the famous British-designed Bailey bridge for the past year and a half. In that time more than 200 units of the jigsaw panel bridge, which can be quickly assembled, have been turned out by the Virginia plant for the use of American and British invaders of Normandy and Brittany.

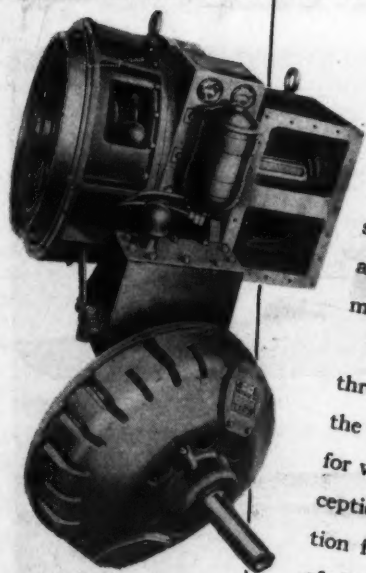
Credited by Field Marshal Sir Bernard Montgomery with much of the swiftness of his successes in Tunisia, Sicily and Italy, the Bailey bridge has

become standard equipment for the U. S. Army, as the ease and speed with which it can be assembled in the field cut delays in the movement of troops and equipment in the wake of enemy demolition. The Virginia Bridge Co. has been a principal source of these prefabricated units for the War Department and has been producing them on an around-the-clock schedule. For the performance in supplying these bridge units, as well as numerous other war and construction goods, this company has received the War Department's award of the Army-Navy "E" flag and white stars.

Personnel Appointments At Universal Power Corp.

Three additions to the executive staff of Universal Power Corp., manufacturer of welding equipment, located at 4297 Euclid Ave., Cleveland 3, Ohio, have been announced in the appointments of C. William Pfeil as Vice President, Frank Stockton as Chief Engineer, and Fred Reinke as Welding Engineer. These appointments have been made as part of the company's policy of post-war expansion for service to the welding industry.

"FLUID" FIGHTING UNITS ... Now and Later



The same transmission principle which has been a distinguishing feature of American tanks and tractors... given them the ability to negotiate rough terrain or quickly accelerate and take advantage of short, smooth stretches... will give all heavy-duty road building equipment a new operating efficiency.

The Twin Disc Clutch Company, through its intimate experience in the building of hydraulic drives for war services, has developed exceptional engineering and production facilities for the manufacture of Hydraulic Torque Converters (Lysholm-Smith type) and Hydraulic Couplings. That's why Twin Disc welcomes an opportunity to counsel with you on your plans for new dirt-moving equipment. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).



TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

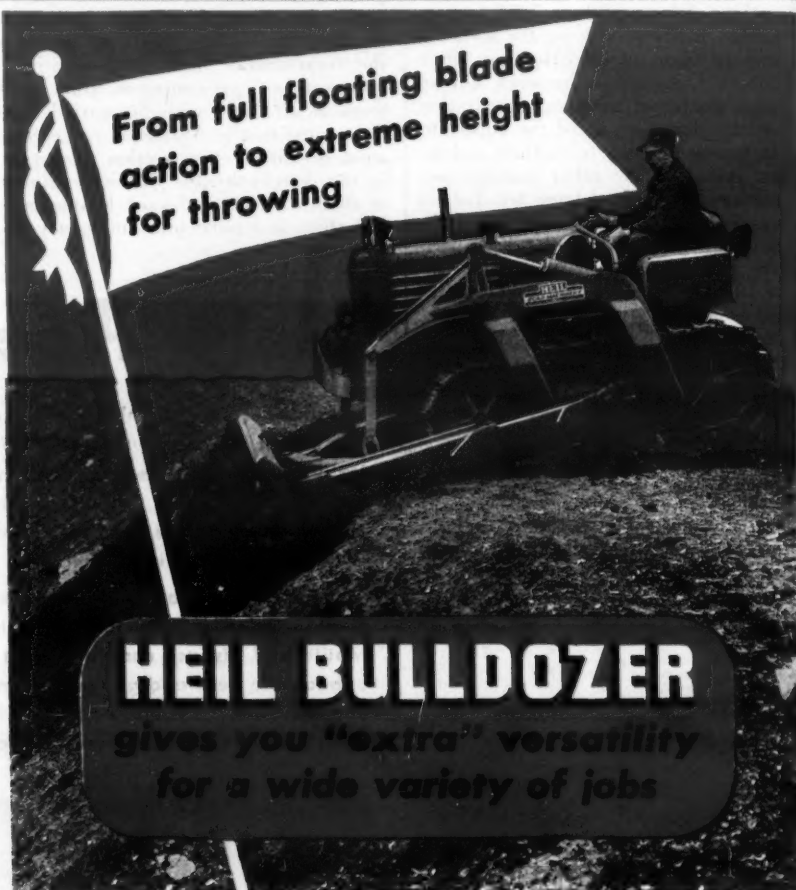
Reduction Gear



Power Take-off



Machine Tool Clutch



HEIL BULLDOZER

gives you "extra" versatility for a wide variety of jobs

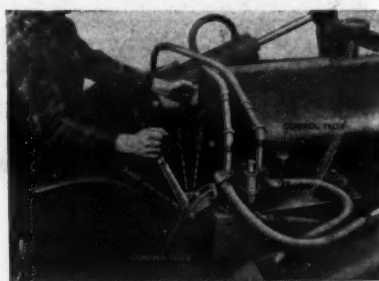
Tailormade for Cletrac Tractors

One of the big reasons why you like this unit is the fact that you get fast, accurate blade control with the sensitive, dependable Heil hydraulic system. You can let the blade float to "follow through" on "over-the-bank" thrusts, or you can raise it to extreme height.

This Heil hydraulic system is the next thing to a perfect leak-proof unit. It stays in adjustment and gives a minimum of trouble. Perfect balance, full visibility, and many other famous Heil features assure you of many years of satisfactory service and extra profits.

R-38

Write for bulletins



Control Lever Operation is simple, easy, convenient, and troublefree

RAISE position is back; HOLD position is center; DOWN position is forward. To float blade, push control lever to DOWN position until blade touches ground—then push down on control lever knob to release catch and move lever to extreme forward position.

SEE YOUR CLETRAC TRACTOR DISTRIBUTOR



THE HEIL CO.

GENERAL OFFICES

MILWAUKEE 1, WISCONSIN

Buy A Share
In America

Lend a
HELPING HAND
with your
WAR
BONDS

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Rock Asphalt Used For Texas Airfield

Additional Runway Paving With Uvalde Asphalt on Sand-Shell Base; Barges Delivered All Supplies

TRANSPORTATION difficulties of considerable magnitude were successfully overcome by Brown & Root, Houston, Texas, in the prosecution of a contract for the construction of additional facilities at the Matagorda Peninsula Gunnery and Bombing Range off the Texas coast, awarded in 1944 by the Galveston Office of the U. S. Engineers. The Brown & Root contract consisted of the construction of two additional runways 4,000 feet long and 150 feet wide, and widening of one taxiway, 4,000 feet long, from 50 feet to 150 feet, as well as the shaping and drainage of dredged fill adjacent to the new runways.

Preliminary Dredging Contract

A preliminary contract had been awarded to the Gulf Coast Dredging Co. of Texas City for placing 500,000 cubic yards of dredged fill in the 200-acre area which was later improved under the Brown & Root contract. Three dredges, the Omega, 20-inch steam-electric dredge of 750 hp, the Matagorda, an 18-inch diesel-electric dredge of 750 hp, and the Velasco, an 18-inch diesel-electric dredge of 350 hp, were all used in this work. The material, which consisted of about 60-40 proportions of sand and shell, came from depths of 10 to 20 feet, and was handled through a discharge line with a maximum length of 5,500 feet and an average length of 3,000 feet. The fill, which under this contract was placed to a tolerance of 1 foot above or 6 inches below grade, was started at the shore line, with the discharge line extended as the fill over low areas progressed. Production averaged 10,000 to 12,000 cubic yards per 24-hour day.

Brown & Root Grading Operations

Four 8-cubic-yard LeTourneau scrapers, pulled by Caterpillar RD8 tractors, were used by Brown & Root in shaping the dredged fill. The entire fill area was compacted to a density of 90 per cent under AASHTO standards by five Farmall tractors pulling 10-wheel pneumatic-tired rollers. A 3-inch topping of local soil containing sod was placed as final dressing of all areas between the runways. This was done by a Caterpillar elevating grader with a 36-inch cutting disk, loading to twenty-four Chevrolet trucks, which hauled the material an average of 1½ miles to the site where it was spread by motor graders.

Incidental work included the installation of 3,200 feet of 44-inch corrugated-metal pipe in a ditch excavated by a Northwest ½-yard dragline which was also used in laying the pipe.

Care of Equipment

Because of the remoteness of the job, and the large amount of equipment being operated, the contractor found it advantageous to maintain a rather completely equipped repair shop on the Peninsula. Equipment in this shop included a drill press, a Hill-Clark lathe with a 16-inch swing and 5-foot bed, and a Whitney hand milling machine, both of which proved of value in manufacturing much-needed parts which could not be obtained without considerable delay. A Weaver 20-ton hand press, a Meyers power hack saw and a pipe A-frame with a Yale 1½-ton chain hoist were used in this repair work, while a Star brake-lining machine and a battery

charger aided in the maintenance of the automotive equipment.

As an example of the expedients practiced to keep machines in operation, at one stage in the construction a crane with its engine rewired to operate on only five of its six cylinders unloaded cement while its crawler tracks were completely removed for repair.

Storage for 20,000 gallons of fuel oil was provided on the Peninsula by the contractor, and a Graco Convoy Luber took care of field lubrication. Numerous Kohler light plants of varying sizes were available for night operations.

Sand-Shell Base

Shell for the sand-shell base was dredged from deposits in Matagorda

Bay, located approximately 25 miles from the point of use. The dredge, which was equipped with a screening and washing plant to eliminate fine material, discharged directly onto steel barges of various sizes which were moved so that two were being loaded, two unloading, and two were in process of transfer at all times. Production of shell base, in spite of the 25-mile water haul, averaged 1,000 cubic yards per day.

At the Peninsula, these barges were unloaded by a 1¼-cubic-yard Northwest clamshell, 20,000 cubic yards being placed in stockpiles before hauling was commenced. This same crane assisted by others, when available, transferred shell from the stockpiles to a steel bin from which thirty Ford and Chevrolet trucks obtained their 3-yard loads for the average 1-mile haul. Arriving at the runways, these truckloads were dumped in windrows so spaced as to provide 400 cubic yards of shell per station of the base which was 160 feet wide, 10 feet wider than

the finished top.

After the shell had been spread by motor graders, local topsoil having a plasticity index of 3 was spread over its surface. This material was loaded from available pits on the Peninsula by a Caterpillar elevating grader, pulled by a Caterpillar D8 tractor. An approximately 8-inch thickness of loose shell, plus a 1½-inch thickness of topsoil, was windrowed by two Caterpillar No. 12 motor graders and mixed dry in widths of 7 feet by a Wood traveling mixer, running for the full 4,000-foot length of the runway.

Approximately 7½ per cent of water was added to the mixed sand-shell material by a 1,000-gallon tank truck. Motor graders were used to shift the top half of the course into windrows, while the lower half was compacted by pneumatic rollers, after which the windrows were also spread and compacted.

Tack Coat

Emulsion for the tack coat was shipped (Concluded on page 50)

EARTH MOVING TODAY ... AND TOMORROW

BIG TIRES . . . built by Firestone . . . are speeding the day of total victory for the United Nations. They're moving earth to build landing fields, roads and bridges faster than they've ever been built before.

Your postwar projects . . . building highways, flight strips, airports, dams and waterways . . . will call for speed and flotation . . . for longer, faster hauls. You'll

need big tires to speed up these new jobs and do them at lower cost.

Firestone pioneered the big, rugged tires for modern earth moving equipment. It will pay you to talk over your plans for tomorrow with the Firestone tire representative. He will show you how big tires made by Firestone can help you increase your postwar profits.

Listen to the Voice of Firestone and the Firestone Symphony Orchestra, Monday evenings, over N.B.C.

ALL-NON-SKID
EARTH MOVER

GROUND GRIP

ROCK GRIP
EXCAVATOR



Firestone
OFF-THE-HIGHWAY TIRES

N. J. Highway Shops Are Well Equipped

(Continued from page 2)

very large saving, both in money and in time, in salvaging parts and getting the equipment back into service.

In addition to the usual repair tools, this department boasts the possession of the following equipment: a Kwik-Way piston-grinding and turning outfit, a Kwik-Way main bearing tool, a Kwik-Way cylinder-boring machine, a Kwik-Way valve-seat grinder, and a Kwik-Way portable piston grinder. There is also a Blackhawk Power-Packer for cylinder-sleeve pulling and replacing, and a Walker-Turner Model GR 50 bench grinder, equipped with a 1/2-hp electric motor and an eye shield.

A thorough examination of trucks and equipment made in the general repair section includes not only the motor tear-down but a check on every part of the body and chassis. The department is equipped to do every needed repair or make renewals of broken or worn parts. Body and fender straightening, torch and arc welding, brazing, soldering, metal bumping, door alignment, rebuilding seats and recovering tops, and wood-working are all included in the operation of the shop. Equipment is varied and ample, and includes such items as an Acme bolt cutter, a Van Dorn electric drill, a Wilson-Ford distributor timer, a Pangborne Type AC-3 sandblasting outfit, several G-E motor-driven Ingersoll-Rand Type-30 air compressors, and a complete Power-Plus outfit for fender straightening and body repairs, including hydraulic-jack hammers. Painting and spraying are done by brush and a DeVilbiss gun in a fan-vented paint room. Brake lining is done with Thermoid TM outfits.

Blacksmithing operations are carried on in a well equipped shop at the rear end of the main building. Three round metal-enclosed forges, a number of anvils, the usual emery wheels and drop hammers, a Niles-Bement-Pond drill press, a bending plate and sheet shaper, power shears, and smaller equipment are included in the tool installation. For pipe work, a Greenlee Type 770 hydraulic pipe bender and an Oster No. 304 1/2 to 4-inch threading machine are used.

The woodworking shop fabricates signs, truck-body parts, and kindred wood equipment, and at times even makes its own rowboats. The equipment here is modern and well arranged and includes a 14-inch Delta band saw, a rip-saw, a planer, a Detroit Surfacing Machine Co. Model X-4 electric sander, and a very adaptable tool, a DeWalt combination saw, for any angle cutting and dado work.

Sheet-metal work and welding are done in a tile-enclosed room along the west side of the main building. The equipment includes a sheet-metal power shears, a Drews & Krump bender, a Pexto roller, and a Wiedemann Type 4-R turret punch press. Welding is done in the shop with Westinghouse and Hobart apparatus, and in the field with portable acetylene welding equipment.

All equipment is tested for electric deficiencies, the ignition, wiring, batteries, and spark plugs in trucks and other equipment being carefully inspected. Repairs to electric traffic signals, blinker lights and lighted signs are made, and new wiring and parts installed where required. This work is done in the main service building and also in the garage sections; a special electrical testing laboratory is located in one of the large buildings adjacent to the garage buildings. For this work and for electrical repairs on the road, the station is especially well equipped with repair and test apparatus, including a Sun battery tester, two Delco electric generating out-

fits, an A. C. spark-plug cleaner, a Wilson photoelectric headlight tester, and varied testing equipment for checking wiring, lights, condensers, magnetos, armatures and other electrical parts. Battery charging is done with G-E Tunga chargers and a Blitz battery charger.

An efficient system of parts and tool storage is maintained with a stock room for truck and equipment replacement parts and a tool room located in the main service building, and an electrical-parts stock room in the electrical department. A controlled system of requisitioning affords a complete record of the location of tools and of the parts allocated to specific jobs.

Greasing is done in a detached brick building 26 x 32 feet, adjacent to the main service building. It contains two greasing pits and has convenient racks for grease guns and other lubricating equipment. Car washing and degreasing of motors and other parts are done in an adjacent frame building 25 x 40 feet. Motors are handled by a 1,000-pound chain-hoist crane. A metal en-

closed vat is used for degreasing operations and car cleaning is done with a Hypressure Jenny Model JMA.

Storage Facilities

Ample space is available for the stor-

age of parts and for equipment and trucks. A large parts storage building 65 x 95 feet, with concrete block walls, wood roof on steel trusses, and concrete floor stands just to the rear of the main (Continued on next page)

Write
For
Details



A TOUGH ROLLER FOR TOUGH JOBS

Pierce-Bear 2-5 Tons
Variable Weights

Engineered for economical operation where the going is tough. Compact, easy to operate. Narrow rear roller gives heavy-duty compression. Built-in water tanks for wet rolling. Powered with Allis-Chalmers Industrial Heavy-duty Model "B" gasoline engine.

Manufactured by

H. W. LEWIS EQUIPMENT COMPANY

431 Madison Avenue
SAN ANTONIO 3, TEXAS
Phone: Garfield 6137

Production line manufacturing of PMCO **WELDED DIPPERS** effects economies in fabrication

Volume production means manufacturing economies that give bigger values to users. The wide acceptance of the weight saving and added strength features of PMCO Welded Dippers throughout the power shovel field enables us to make better dippers on an economical cost basis.

Other features that give added values are refinements in design such as wide set teeth at extreme outer corners of the lip that reduce digging resistance—one-piece, full length manganese steel front (12% to 14% manganese) with strength to support wide set teeth—tapered sides and back that assure faster dumping—wide spaced hinges set ahead for greater strength and easy closing of door — tapered socket type teeth, easily replaceable and the improved latch mechanism are but a few of many new developments incorporated in the modernized PMCO Welded Dippers.

We operate the largest and most complete
manganese steel foundry in the United States



**PETTIBONE
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CORPORATION**

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Highway-Sign Care In New Jersey Shops

(Continued from preceding page)

service building. Several other smaller buildings are also used for storage. A large stock of parts of all kinds is on hand. The custom of having a considerable number of spare parts and other equipment on hand, which was followed in the past, is now paying dividends, with many parts difficult to obtain. Equipment not subject to weather conditions is also stored in the open to the northwest of the plant, as are miscellaneous highway supplies such as gravel, lumber, etc. Detachable snow plows, brought to this station for reconditioning, are stored outside; large motored equipment, passenger cars and trucks are kept in four large garage buildings.

These garage buildings, and the electrical department and office building, are of very practical construction and well adapted to their purpose. They are set 50 feet apart, arranged parallel, facing on the wide concrete drive from the main entrance. Each building is 60 x 250 feet, has brick pilasters with concrete-block curtain walls, a wood roof on open steel trusses, and concrete floors. The walls, 16 feet high, are arranged with large window areas of steel sash, which make the interior unusually light. Light servicing is done and a supply of small service tools and equipment is kept here; an Ingersoll-Rand Type U-85 air compressor has recently been installed.

The electrical department and office building houses the electrical drafting rooms, offices of the Superintendent of Plant and Equipment, the Fernwood accounting office, electrical laboratory, research laboratory, and the electrical sign and signal repair shop. Two American Coach & Body ladder trucks for servicing traffic lights are stored here. A supply of General Cable Co. conduit cable, signal parts, Wheeler reflectors, General Electric and Westinghouse testing equipment and kindred stock and equipment comprise part of the working supplies in use.

A portion of the grounds to the northwest are given over to the growing of evergreens, trees and shrubs, which are transplanted along state highways for roadside development.

Sign Maintenance and Storage

Highway signs of the Maintenance and Electrical Divisions are repaired and refinished both at the station and on the road. At the station the work is done in two all-metal buildings, 35 x 100 feet and 65 x 200 feet, of one high story. Hand work is carpentry and painting. A small metal enclosed room is used for sand blasting of metal signs. Sign parts, standards, and accessories are stored in these buildings also, in well arranged bins and racks. For road repairs a portable sand-blast outfit is mounted on a

truck, and the cleaning and repainting are done without removing the signs.

One of the types of signs used at circle intersections is an illuminated box sign in which the electric bulbs inside the box throw their light through glass panels on which the road directions are painted. These were formerly of all-metal construction, but are now being made in the carpenter shop of wood frame and Prestwood backing and sides.

For weather testing of signs and finishes, a number of signs and standards have been erected in the station grounds. Tests of road stripe and line paint are also carried on. In this connection, for the convenience of supplying the striping machines on the road, a steel tank of 40-gallons capacity is mounted on the rear of the truck body and filled with paint, kept agitated by a propeller driven by a small air-cooled motor, and equipped with large molasses-type spigots. This is one of the many labor and time-saving pieces of equipment that have been developed and built by the men at the station.

Traffic signal lights, blinker lights, illuminated signs, and their control equipment and wiring are inspected, repaired, tested, and serviced in the electrical department. A development laboratory is also maintained here for investigation and research in modern methods and equipment.

In addition to the yard storage and that in the several buildings noted, the Purchase and Stores Division of the Highway Department, under the supervision of R. W. Wildblood, maintains a large warehouse at the station in a 50 x 260-foot building with brick-faced concrete-block walls and gypsum slab roof on steel trusses supported on steel framing. Miscellaneous stock and equipment are well arranged. A railroad siding runs directly alongside the building to facilitate receiving of goods.

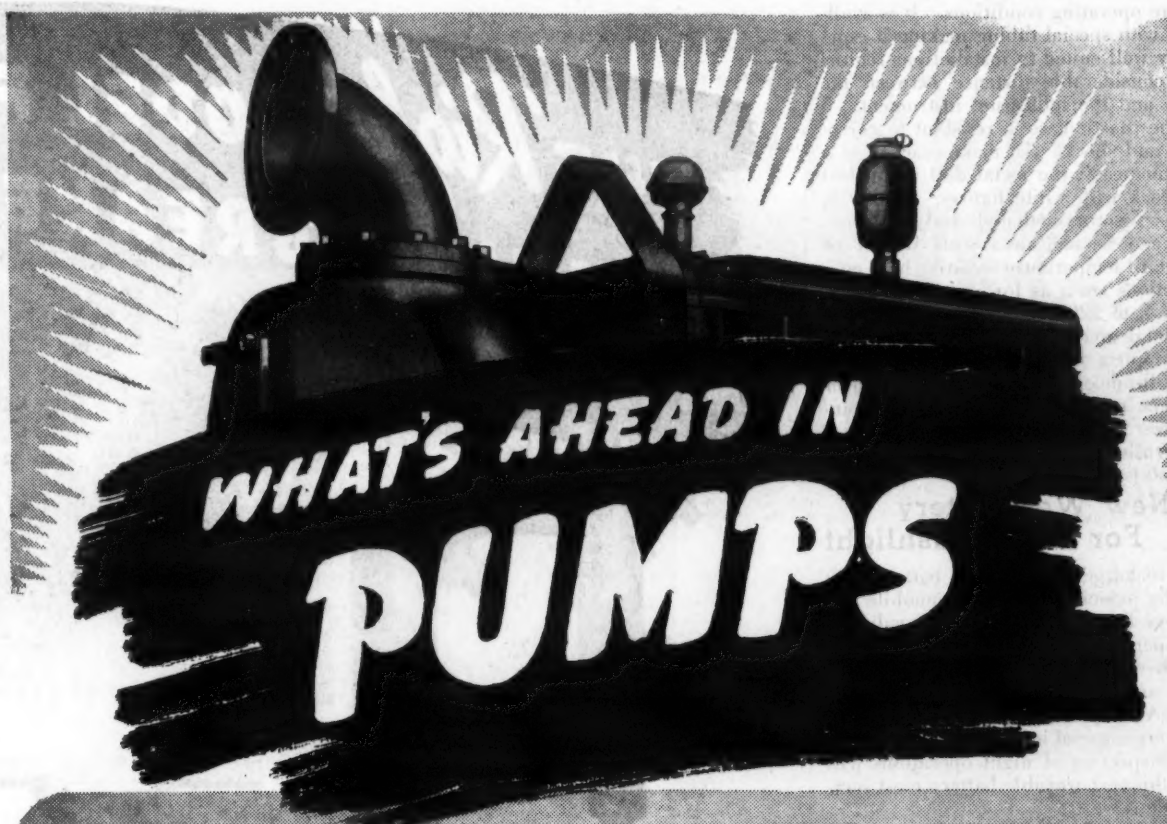
The physical and chemical testing of materials are done by the Laboratory Division in a well designed two-story fireproof building, located just inside the main entrance gate of the station. The building is 50 x 125 feet with brick and

tile curtain walls between steel framing; floors are concrete, and the roof is concrete slab. Testing of cement, sand and aggregates, and bituminous materials is done here. Sample cores taken from highway construction are inspected and tested. The chemical and physical laboratories are exceptionally well equipped with the most modern apparatus. Chemical analysis and testing are done on the second floor and physical testing on the ground floor; specimen making for tests and soil testing are also carried on here.

Fire Protection

The excellent fire-protection equipment installed at the station is worthy of note. The main service building is protected by automatic sprinklers, supplied by a 70,000-gallon tank on a 100-foot trestle and by a tie-in with a 16-inch city main through an 8-inch yard main. The tank is filled by a motor-driven Goulds deep-well pump, housed in a fireproof pump house under the tank trestle. In addition to supplying the sprinklers, the

(Continued on page 44)



**HIGHER EFFICIENCY . . . BIGGER
CAPACITY . . . MORE FEATURES
BETTER PERFORMANCE . . . LOWEST
COST PER GALLON PUMPED . . .
100% SELF-PRIMING . . . NEW
DURABILITY AND STAMINA**

Yes, there's a lot to look forward to, and you won't be disappointed. Sensational new CMC Dual Prime CENTRIFUGALS are serving Uncle Sam now — available to all soon! There's a new era in pumps dawning and out in front will be CMC!



GET ADVANCE INFORMATION NOW!

**CONSTRUCTION MACHINERY CO.
WATERLOO • IOWA**

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For the Latest in

**PUMPS . . MIXERS . . CON-
CRETE GUNS . . BATCHING
AND PLACING EQUIPMENT
.. HOISTS . . POWER SAWS
.. CARTS AND BARROWS!**



**Complete Line
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DERRICKS
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WINCHES**

SASGEN DERRICK CO.

3101 W. Grand Ave., Chicago 22, Ill.



The Taylor thermometer for hot-mix plants.

A Dial Thermometer For Asphalt Plants

Originally built for and extensively used by the shipbuilding industry, a new 4½-inch-diameter phenolic-case dial thermometer is now available from Taylor Instrument Cos., P. O. Box 110, Rochester 1, N. Y., for use in hot-mix asphalt plants. This instrument is mercury-actuated and is built to withstand severe operating conditions. It is available with special tubing making it especially well suited to installations requiring considerable distance between the bulb and the indicating instrument.

The plastic case is resistant to corrosion and shock. To make reading at a distance easy, the metal dial is finished in black with white figures. This 53K series mercury-actuated dial thermometer can be had in a wide variety of standard temperature-sensitive bulb constructions from as low as minus 40 degrees F to 120 degrees F up to a range of 200 degrees F to 900 degrees F.

Complete information regarding this long-distance indicating thermometer may be secured direct from the manufacturer by mentioning this news item.

A New Wet Battery For Your Flashlight

A rechargeable flashlight battery built on the principle of the automobile wet storage battery, and especially valuable for operations where long continued and steady use of flashlights is necessary, has been announced by the B. F. Goodrich Co., Akron, Ohio. Tunnel engineers, workers engaged in subway construction, and inspectors of night operations will find this rechargeable battery most serviceable.

Eighteen months of tests have proved that the miniature wet battery is the answer to the expendable dry-cell problem in many operations, particularly at this time when dry cells are in critical supply and when long life is so important for uninterrupted flashlight service.

The company claims that the wet storage batteries are more economical than dry cells when flashlight service is required in volume, or where batteries require replacements more than once every two weeks. The batteries give the same light as the industrial-type dry cells. A freshly charged wet battery will give about three hours of constant light. Batteries can be used in the standard three or five-cell dry battery case with the use of spacer plugs.

Substantial savings when the wet batteries replace the dry cells is reported to be one of the big advantages of the new-type battery, which will outlast the life of 400 dry cells. In one test of 575 batteries in 375 flashlights operating for one year, the saving was \$3,960 in battery operating costs, without considering the expenditure necessary for the recharging equipment.

The new wet battery requires a special-type Mazda lamp which comes in 1.9-volt 0.6-ampere size with screw base or flange base. Actual wattage consumed with the wet battery is 50 per cent more than with the dry type and since light is directly proportional to watt consumption the wet batteries give

a distinctly brighter light than the older type. The light is constant, since the voltage drop between a full charged and discharged wet-cell battery is only 0.35 volt, while a dry cell drops approximately a full volt.

Full information regarding the new wet flashlight batteries and recharging equipment, which is sold by the same company together with a tester, may be secured direct from the manufacturer by referring to this item.

Air-Express Speed Serves Contractors

Sixteen years ago on September 1, the first delivery of Air Express crossed the country from New York to Los Angeles. The package weighed 15 pounds and it cost the shipper \$15 for the delivery. Today a package of the same weight would be delivered for \$4.20. There are now 350 airports handling Air Express in the United States, connected by 45-

000 miles of domestic airways.

Contractors engaged in vital war construction have been frequent users of this speedy form of shipment to get spare parts for disabled construction equipment. We witnessed one such case in Fargo, N. D., where a large machine was put out of service one morning by a broken main drive-shaft. A telephone call to Columbus, Ohio, ordered the

shipment of a new shaft which arrived early the next morning by Air Express and the shutdown of the job was only 21 hours.

The number of annual shipments by Air Express has grown from 17,000 to 1,559,497 in sixteen years and the weight from 500,000 to 31,000,000 pounds, according to L. O. Head, President of the Railway Express Agency.

SPEED OPERATION for Snow Plows and Road Machinery with the . . .

MONARCH Hy-Rocket Power Hydraulic Control



Lifts plows ten times faster than hand pump.
Fan-belt driven by truck engine. Cab-controlled.
Easy installation on new or existing equipment.
Priced for the most conservative budget.

MONARCH ROAD MACHINERY COMPANY, 327-329 Front Ave., N.W., Grand Rapids 4, Michigan

THE Right MODEL FOR Every PAVING BREAKER JOB!

CLEVELAND C11

This 58-lb. tool has a long stroke and strikes a very heavy blow. It is noted for its economical air consumption.

CLEVELAND C9

Weights 82 lbs., and is a slugger suitable for reinforced, well-seasoned concrete. A No. 85 compressor operates two.

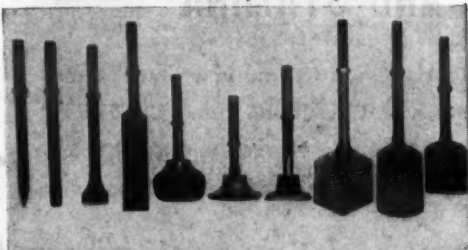
CLEVELAND C7

This 80-lb. model is best for all around work on paving breaking and demolition jobs. Two C7's run from a No. 85 compressor.

CLEVELAND C10

This is a smaller (35-lb.) model for light work, trimming, etc. Three C10's run from a No. 85 compressor.

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Moil Narrow Wide Digging Sheeting 2" Tampers 5" Tampers Clay Clay Asphalt Chisel Chisel Blade Driver Bar Bar Blade Spade Cutter

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Mechanized Seeding On No. Car. Highways

Development of Heavy Harrow and Use of Farm Equipment Speed Work; Future Roadside Plans

By FRANK H. BRANT, Landscape Engineer, North Carolina State Highway and Public Works Commission

THE most important roadside-development activity in North Carolina in 1944 is the same as in pre-war years, erosion control. The difference from the past lies in the fact that erosion control is practically the *only* phase of roadside-development work now active in the field. Regrading to flatten and round slopes on old highways, the development of special roadside areas, planting, and the selective thinning and pruning of woodland areas have necessarily been postponed. The maintenance of established "feature point" plantings, such as intersection areas, is being continued, but is restricted to the minimum care necessary to protect the investment in the plantings.

During the calendar year 1943, there were nine new construction projects (all Defense Access Highway Projects) seeded, with seeding areas totaling more than 334 acres. In 1944, seeding completed by July 1 totaled approximately 210 acres on six projects. At the present time, all vegetative erosion-control work on new construction in North Carolina is handled on a force-account basis by state forces.

Grasses Used

Korean Lespedeza, Sericea Lespedeza (for steep fill slopes), Sudan grass, oats, and cereal rye are now used for roadside seeding, depending upon the season of the year. In this way, there are usually only about two months during the winter when seeding cannot be done satisfactorily. Although all of these "crops" except Sericea Lespedeza are annuals, Lespedeza reseeds very satisfactorily and, in the case of the other temporary cover crops, volunteer native grasses develop a more permanent cover or Lespedeza is seeded during the first spring following.

Under more normal conditions, more permanent perennial grasses or mixtures of grasses and legumes would be seeded in many locations, but for simplicity and speed of operations, as well as economy in materials, the seeding of single crops has been adopted for the duration of the war.

In cooperation with the North Carolina Agricultural Experiment Station, a considerable number of field experiments are being conducted with different plants for erosion-control use, particularly further and improved use of Lespedeza Sericea and also the relatively new and also perennial Lespedeza Latisima. Other experiments are planned on incorporating sawdust into the soils, and it is hoped that some trials will be possible with the use of asphaltic mate-



Wide cross sections with flat slopes are adapted to speedy mechanized seeding.

rials as a temporary erosion retardant while new seedings are becoming established.

Unfortunately, most of the projects seeded in 1943 were in areas where mulch material was not available for purchase without shipment from a dis-

tance and where the labor shortage was so acute that native-grass mulch could not be collected from waste areas in the vicinities of the projects. A minor but still important advantage of seeding heavy-growing plants such as Sudan

(Continued on page 54)

Dependable EUCLIDS COST LESS TO OWN



On scores of big earth and rock moving jobs, and in industrial operations too, Rear-Dump and Bottom-Dump EUCLIDS are moving more yards and tons per hour at consistently lower cost. Carrying pay loads of 15 to 30 tons at speeds up to 33 m.p.h., EUCLIDS cut down the round trip time from the loading unit to dump and carry more pay loads per hour.

Designed and built throughout for the hard service of off-the-highway hauling, EUCLIDS actually cost less to own than ordinary hauling equipment. Lower operating and maintenance



cost, plus dependable trouble-free operation, has made Euclid the favorite equipment of contractors and industrial users for hauling all kinds of heavy excavation and materials.

If you need new equipment for a current job or are planning for your peace time requirements, be sure to consult your Euclid distributor or write us for descriptive literature.

The EUCLID ROAD MACHINERY Co.
Cleveland 17, Ohio



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CONCRETE
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PAVEMENT VIBRATORS

Three types: *Vibrating screed*, full-width, propelled by hand-operated winch and cable or pushed ahead by finishing machine. Gasoline power plant.

Tubular internal, extending entirely across slab, mounted in front of finisher. Gasoline or electric power plant with flexible shaft drive.

Vibrating pan, full-width, carried by two-wheeled trailer behind any standard finisher. Gasoline or electric power plant.

STRUCTURAL CONCRETE VIBRATORS

1, 3, and 4 H.P. gasoline, air-cooled, 4 cycle motors; flexible-shaft drive; interchangeable vibrator heads lubricated for life. Wheelbarrow carriers.



Pioneers in Concrete Vibrators

**BAILY
VIBRATOR CO.**

1539 WOOD STREET, PHILADELPHIA, PA.

Pre-Treated Aggregate Used on Mass. Project

(Continued from page 7)

yard of surface. RC-5 is a rapid-curing asphalt material of high viscosity suitable for surface treatment. It was originally planned to use SC-5, a slow-curing residual asphalt, but the Public Works Department was unable to purchase the SC-5 because of war restrictions. It was then decided to use the RC-5 although some doubt was expressed that such a small volume of RC-5 would be able to hold in place aggregate as large as $\frac{3}{4}$ inch in size. Maintenance engineers say that only through the use of pre-treated aggregate could the stone adhere to the asphalt that had been applied to the road.

The RC-5 was furnished and applied by contract with the Trimount Bituminous Products Co. of Everett, Mass., at a cost of 9½ cents per gallon. A 2,000-gallon tank truck equipped with an oil burner which heated the cut-back to 210 degrees F applied this asphaltic oil through a 12-foot spray bar on the back of the truck, spraying a section 12 feet wide x 1,000 feet long and then waiting for the surfacing to catch up before moving ahead. About 2,000 gallons a day were used.

Spreading the Aggregate

In the meantime, $\frac{3}{4}$ -inch pre-treated stone was loaded from the stockpiles onto trucks by means of a Conant loading machine with a canvas belt conveyor. Three 8 to 10-ton trucks, each carrying about 5 tons of $\frac{3}{4}$ -inch aggregate, were used to transport the stone to a Galion chip spreader having a 12-foot trough equipped with an agitator. A loaded truck backed up to the spreader, and slowly dumped its load into the hopper while backing over the treatment until all the stone had been spread. About 27 pounds of $\frac{3}{4}$ -inch stone per square yard was spread in a 12-foot strip.

On top of this, and before rolling, a layer of $\frac{1}{2}$ -inch pre-treated stone was spread immediately to fill up the voids in the larger stone. The $\frac{1}{2}$ -inch stone was also loaded by a conveyor into two 2-ton trucks and distributed by a Handy-Sandy spreader with an 8-foot trough at the rate of 8 pounds to the square yard, making a total aggregate weight of 35 pounds per square yard. This completed a layer of stone $\frac{3}{4}$ inch thick which was later compacted under the weight of a state-owned 10-ton 3-wheel Galion gasoline roller. After a thorough rolling, this lane was opened to traffic in four or five hours. The remaining two 12-foot lanes were treated in similar fashion.

Low Cost of Paving

The entire work, with the exception of the cut-back application, was done by a state maintenance crew of eight men and a foreman. This resulted in the low cost of 9 cents a square yard of paving, including the cost of the pre-treatment for the aggregate.

Four miles of penetration macadam from Methuen to Lowell have been surface-treated with similarly treated aggregate. There 0.25 gallon of RC-5 was applied to the square yard as a seal coat, after which 30 pounds of $\frac{1}{2}$ -inch pre-

treated stone per square yard was spread and rolled. On macadam surfaces, the use of smaller-size stone is advisable. On both types of surfaces the pre-treated stone is giving satisfactory service.

This method of pre-treating aggregate has been developed in the Maintenance Section of the Massachusetts Department of Public Works, which is directed by James E. Lawrence, Maintenance Engineer. Chief Engineer of the Department is Raymond W. Coburn. Carl Flynn was Foreman on the Rowley job.

New Use for Zeppelin Base

A small part of a 1,300-acre tract in Hybla Valley, Va., about 10 miles south of Washington, D. C., is the site of the new bituminous-pavement research project of the Public Roads Administration and the Highway Research Board of the National Research Council. This work is also a cooperative arrangement between the Highway Research Board and the Asphalt Institute. (See C. & E. M., September, 1944, pg. 18.)

This land was brought under a single

ownership in 1929 reputedly for Hugo Eckener for use as a Zeppelin air base, but is now being prepared for the field tests of non-rigid bituminous pavements

under loads ranging in magnitude from those of automobile and truck wheels to those developed by the wheels of some of the largest airplanes.




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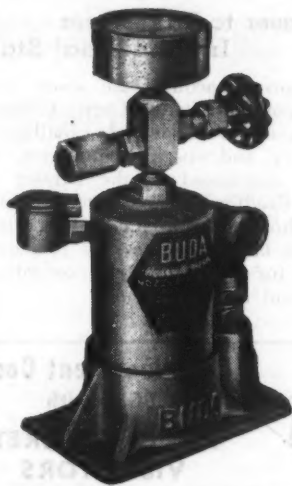
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The new Buda nozzle tester.

New Nozzle Tester For Diesel Engines

The fuel nozzle on a diesel engine must be accurate, as it is the meter of the fuel which drives this widely used internal-combustion engine. A new portable nozzle tester which can be used to check, adjust, and set nozzles right on the job and keep a diesel engine operating at top efficiency has been developed by The Buda Co., 15,412 Commercial Ave., Harvey, Ill.

In using this Buda nozzle tester, the small reservoir is filled with clean fuel oil and the correct adaptor selected for attaching the injection nozzle to the tester. Next the hand valve is closed tightly and the pumping lever used to flush the nozzle. Then the hand valve is opened and pumping continued to cause a registration on the gage which shows the exact pressure at which the nozzle is adjusted. With the nozzle still attached to the tester, adjustments can be made to the nozzle, thus saving both time and labor.

Complete information regarding these testers, which are available in either 3,000 or 5,000-pound-per-square-inch gage pressures for use with any diesel fuel injector, will be found in Bulletin No. 1170 which may be secured direct from the manufacturer.

New Curing Papers For Concrete Slabs

Three new paper products for use in curing concrete have been announced by the Richkraft Co., 228 No. La Salle St., Chicago, Ill. The first of these construction paper products is a plastic-treated curing paper known as Skufpruf, the second a road-curing blanket manufactured in 10-foot widths, and the third a "stringer sheet" for prolonging the life of curing blankets.

Skufpruf is a concrete-curing paper treated with a plastic to increase its toughness, reduce shrinkage, and give it a high wet strength. The plasticizing treatment starts when the pulp first enters the beaters in its manufacture and is carefully controlled throughout the manufacturing stages. This process is not a surface treatment, but is a complete impregnation of the individual pulp fibers with the plasticizing chemicals, according to the manufacturer.

Manufacturing of curing paper in 10-foot widths by Richkraft is a new step. Heretofore, paper has generally been offered in widths not exceeding 7 feet. The change to 10-foot widths makes possible easier handling, saves money and time, reduces by 25 per cent the labor in sealing laps and provides a smoother-rolling blanket unit in the field. On a 22-foot road, for example, this new Richkraft width makes possible 24-foot 6-inch blankets with two 10-foot rolls and one 6-foot roll instead of using two 7-foot rolls and two 6-foot rolls. On a blanket 26 feet 6 inches wide, labor cost is thus cut one-third.

The "stringer sheet" method for prolonging the service of concrete-curing blankets is a Richkraft development. This stringer sheet is an 18-inch x 60-foot strip of paper provided with the main curing blanket. The purpose of this narrow strip is to eliminate that part of the curing blanket which overhangs the slab. The overhanging edge ordinarily deteriorates and tears long before the service of the main blanket is fully utilized. Another important advantage of the stringer is the amount of time saved while the forms are being removed. The stringer sheet is rolled simultaneously with the main roll at the time it is manufactured. After the main roll is spread out on the job, the stringer sheet extends along and beneath the outer edge of the blanket between the pavement and the blanket. The stringer sheet is simply turned down along the edge of the slab after the forms have been stripped and held with dirt.

Complete information regarding these new construction paper products may be secured direct from the manufacturer.

**For More Uniform Compaction
at Less Operating Expense—**

INGRAM PNEUMATIC-TIRED ROLLERS

Oscillating axles—to insure uniform compaction

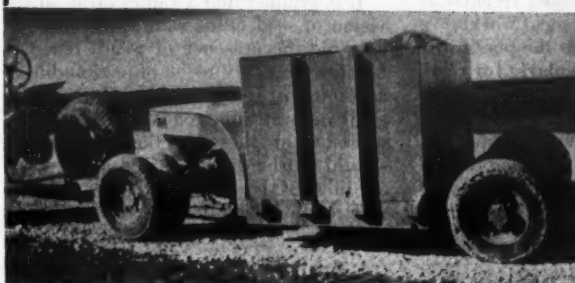
Short turning radius

Electric welding throughout

Low center of gravity—to prevent upsetting

Easily pulled by any medium-sized tractor
Ground pressure 60 to 350 pounds per inch of tire width

WRITE FOR LITERATURE



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For FAST, Low-Cost Drilling. CP-60 MOTORdrifter

FOR drilling in hard, seamy or ravelly formations, for tunneling from Jumbo drill carriages—there is no better drifter than the CP-60 MOTORdrifter. It will do a fast, low-cost drilling job anywhere.

The CP Motorfeed is powered by the compact and dependable rotary type motor. Its sensitive control enables the operator to maintain correct position for maximum drilling and quick reverse for changing steel. Write for further details or arrange for a demonstration of the CP-60 MOTORdrifter under your own conditions. You will like its drilling speed, low air consumption, low maintenance, easy handling.

There are three models of fast-drilling CP MOTORdrifters: the 3" CP-50, the 3½" CP-60, and the 4" CP-70. There is a parallel line of CP Hand-Feed Drifters.

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ROCK DRILLS

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AIR COMPRESSORS
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DIESEL ENGINES
AVIATION ACCESSORIES

Seed-Mulch Material For Roadside Use

In view of the short supply of many of the seeds which are used in forage production and in roadside-development work, the Division of Agricultural Extension of Pennsylvania State College has devoted much time to encouraging and promoting the harvesting of grass and legume seeds without which most planting programs would bog down. Fred V. Grau, Extension Agronomist, Pennsylvania State College, reports that much time has been devoted recently to strictly roadside-development work.

A result of this study is the possibility of marketing seed, particularly for roadside-development work, not as a re-cleaned commodity but as a seed-mulch material which has been chopped or hammermilled previous to baling or possibly bagging. Several contractors with whom Mr. Grau has discussed this have shown ready acceptance of the idea.

Material of this kind has been used in Pennsylvania on athletic fields, on lawns, and other locations, and the results are excellent. The development of this rather radical departure from conventional methods of marketing seed would mean a tremendous saving to all concerned. First, the grower would not be put to the expense of cleaning and recleaning the seed; second, the consumer could buy the product at a lower price because the cost of production is lower, and results would be more satisfactory because of the mulch material included.

It is granted that a rather close supervision of seed fields would be necessary to avoid the presence of weeds listed as noxious or likely to be objectionable to adjoining property owners. Many weeds grow naturally on roadsides so that the presence of these in the seed mulch should not be discriminated against, according to Mr. Grau, but since field inspection and roguing is not a difficult operation, a reasonably clean product

could be produced.

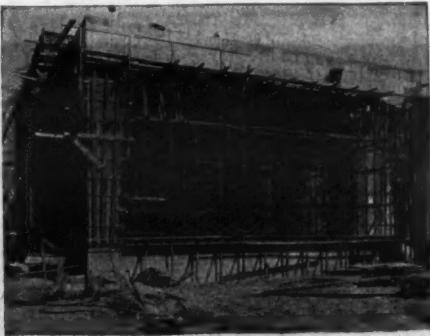
The most serious objection to the plan is the transportation of considerable bulk, which is not looked upon with favor during these times of crowded transportation facilities. Another possible objection would be the difficulty of blending various materials so that a desirable mixture results. It is felt, however, that as soon as responsible authorities can be interested in research work on this problem, many of the difficulties can be ironed out.

Dresser to Take Over International Stacey

Plans to acquire the assets of the International Stacey Corp., Columbus, Ohio, maker of derricks, drilling machinery and similar equipment, have been announced by the Dresser Mfg. Co., Bradford, Pa. A meeting of the stockholders has been called for October 16 to take the necessary preparatory steps for this transaction, according to a recent announcement.

WEIGHT-CARRYING ABILITY Plus VERSATILITY

That's Why It's Economical To Use Safway Scaffolding On Heavy Shoring Jobs Like This



Note the economy with which Safway Scaffolding was employed in the construction of this large war plant at Butler, Wisconsin. Not only did the contractor use it to shore heavy concrete beams at a height of 45', over an extremely large area, in record time (as shown in the illustration above), but upon completion of this phase, quickly dismantled and reassembled the equipment to provide brickmasons with sturdy working bases. Standard Safway Equipment is being used with the same

economy by many contractors for all types of shoring as well as general purpose scaffolding applications because its design and tubular steel all welded construction enables it to be speedily erected, by a few men, into structures that will safely withstand any load or work requirement.

Free—For Additional Information on the design, construction and versatility of Safway Scaffolding write for our new 32-page Bulletin No. CE-1044.

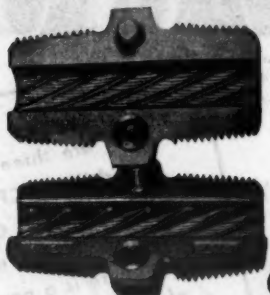


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SAFE-LINE WIRE ROPE CLAMPS

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IT NEVER
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Clamp Does It

FOR ROPE SIZES 1/4 TO 3/4

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Write for details of this—the only PERFECTED wire rope clamp on the market. Millions used by manufacturers, the Armed Forces and industries.

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**Get Stronger, Denser Concrete
Rapidly and Easily with Less
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WYCO Flexible Shaft Drive Vibrators eliminate honey-combing, air bubbles and scaly surfaces. Stronger, denser, high quality concrete is obtained with large savings in material and labor. WYCO machines have a national reputation for high efficiency and low maintenance cost. Both Electric and Gasoline Power driven units are available as illustrated, with interchangeable tools for Grinding, Drilling, Surfacing, Wire Brushing, Sawing, etc.

WYCO Gasoline Power Vibrators are mounted on Wheelbarrow or Stationary Swivel Base. Use standard air cooled engines and have ball-bearing jack shaft with twin V-belts. Equipped with WYCO Patented Jack Shaft Clutch—manually operated—completely disengages engine, prolonging life of shaft core—makes starting quick and easy.

Also—3 Types of WYCO Electric Drive Vibrators

- 1 Nose of hard alloy steel.
- 2 Head completely sealed against grease, dirt or water.
- 3 Cast steel rotor.
- 4 Two Norma Hoffman Roller Bearings and one Ball Thrust Bearing for dependable rotor action under most severe conditions.
- 5 Improved design for more effective rotor impulse to vibrator.
- 6 Protected oil plug for change of oil when needed.

Every WYCO Flexible Shaft has the WYCO Patented Non-Metallic INNER LINES. Makes the Core Last Longer—Runs Smoother—Transmits More Power.

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WE WERE READY FOR WAR: Novo's Line of Construction Equipment met Army and Navy Specifications. To get in the fight, it merely had to put on a uniform of G.I. paint. The same fine Novo Engines, Pumps, Hoists, and Generator Sets that have served you for so many years, were ready to serve your Country. Yes, when the Call to Arms came, Novo Construction Equipment was ready for war!

WE'LL BE READY FOR PEACE: The big Novo Plant won't have to be reconverted. There will be no idle period of preparing for peacetime production. Novo Construction Equipment, tempered by war, will be available for your post-war needs. Come V-Day, Novo will be ready to serve you again without undue delay. Yes, Novo will be ready for Peace . . . and ready to fill your Construction Equipment needs.

We are currently in production on all items illustrated at the right. While most of our production is reserved for the Armed Forces, we can make limited shipments to Civilians with proper Priority.

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**WAR
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TESTED and APPROVED for use on high tensile strength wire rope, by Underwriters' Laboratories—official testing laboratories for insurance companies.

ONE SAFE-LINE CLAMP is designed to hold any wire rope without slipping. WIRE ENDS ENCLOSED. No needle-sharp wire ends, nuts and bolts exposed to injure workman's hands.

STREAMLINED! Will not catch on clothing nor on mechanical apparatus.

Will not foul.

HOLDS A TIGHT THIMBLE. When thimbles are used they will not loosen and fall out.

Connecticut Township Improves Road System

Mansfield Builds 21,000 Linear Feet Of Loose-Gravel Traffic-Bound Road With 190F Funds and Oils Surface With Town-Aid Funds

By A. A. K. BOOTH

† MANSFIELD Township in Tolland County, Connecticut, due east of Hartford, covers 24,270.25 acres, has a population of 3,600 persons, according to the 1940 census and exclusive of collegiate and training-center populations, and has within its confines 130 miles of roadway. The Township enjoys a rural and academic atmosphere, the University of Connecticut being within its limits, but its roadways have been subjected to particularly heavy traffic within recent years as a result of the increased manufacturing activities of the region.

Trunk lines, Routes 32, 44, 89 and 195 under state jurisdiction and maintenance, account for 31 of the 130 miles, but provide only 8 miles of concrete roadway within the Township limits. The Township controls and maintains the remaining mileage, of which 33 miles is black-topped.

Selectmen and Available Funds

First Selectman Burton C. Hall, with his associates, Robert Gardiner and James Sullivan as Second and Third Selectmen respectively, is charged by the community with the responsibility for developing and maintaining the roadway system under the principles of democratic government.

An annual Town-Aid Fund of \$17,750 from the state is used for maintenance, oiling, patching, etc., while a biennial road fund of approximately \$25,000, amounting to \$26,932 for the years 1943-1945, is used for construction under the provisions of Section 190F of the Connecticut General Statutes.

The 1941-1943 Biennium

Under Section 190F, 21,000 linear feet of loose-gravel traffic-bound road was constructed in the 1941-1943 period to meet the increasing needs and demands for better roadways. With the assistance of the Town-Aid funds, this length was oiled.

The roadways, one section of 9,000 feet and the other of 12,000 feet, were designed by the State Highway Department in accordance with the standards for this type of road. They provide a 16-foot travel way with 2-foot shoulders on each side and are built up of a 12-inch base course of selected gravel having a stone content of 80 per cent and a surface course of selected gravel 8 inches thick. All material for such roads is subjected to tests by the State Highway Department and must meet with its approval.

The Gurleyville Section

Nine thousand feet on the Gurleyville road was completed on September 20, 1943, in 90 working days at a cost of \$10,000 and is representative of the jobs done in the 1941-1943 biennium. A ¾-yard Bay City shovel, rented at the rate of \$6.50 per hour, moved the 1,500 yards of earth excavation, 500 yards of rock excavation, and the 3,500 yards of gravel for the surface. It also handled the excavation for the drainage pipes which vary in size from 15 to 36 inches in diameter and which are of plain concrete. The drainage trenches were excavated to a depth of 2 feet below the invert of the pipe, which in turn was provided with 18 inches of cover. In only one way was any trouble experienced when it came time to lay the pipe. This ditch interrupted an ac-

tive stream and it was, therefore, necessary to dig a sump and remove the water therefrom with a centrifugal pump to obtain satisfactory conditions for pipe laying. All pipe culverts were provided with concrete headwalls.

The 500 yards of shale had to be blasted with 60 per cent dynamite placed in drilled holes approximately 4 feet deep and fired electrically. Air for the drills was obtained from a 110-cubic-foot Ingersoll-Rand compressor rented from a local contractor. The laminated and open nature of the ledge rock necessitated many holes and an excessive use of dynamite. The compressor was on the job for a total of 150 hours, while the blaster spent a total of but two days.

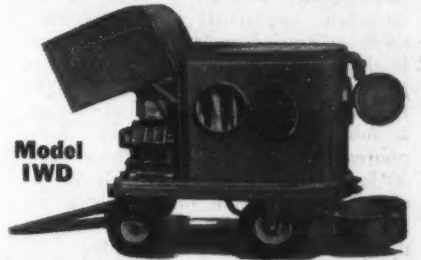
The rock was loaded into two Ford and one GMC 3-yard trucks by the Bay City shovel and wasted at a haul of 2,000 feet from the cut. All trucks were equipped with 32 x 6 10-ply high-pressure tires.

The gravel for the surface course was (Concluded on page 42)

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- 1 Portable units operate through powerful air stream by an effective double separation principle. No dust escapes into the air. Reduces SILICOSIS hazard to safe hygienic limit.
- 2 When applied to rock drills, SPEEDS UP DRILLING TO 33 PERCENT. Drill steel cuts into fresh rock unimpeded by dust or chips. Prolongs life of drill steel. Reduces sharpening costs.
- 3 Quick detachable hood permits easy inspection of hole and changing drill steel without interference from hood.
- 4 When applied as industrial unit, collects dust accumulations that are costly and apt to be a hazard both to men and equipment. Keeps your plant, motors and machinery free from harmful dusts.
- 5 Equipped with Markley-Carter disposal container which permits continuous collection and disposal without closing down the system.



Model IWD
Write for Bulletin 4402 which describes in detail the advantages of using MARKLEY-CARTER DUST COLLECTOR in your quarry and plant.

RALPH B. CARTER COMPANY

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WARCO MOTOR GRADERS

All controls hydraulic type. No physical effort required. Operators do better work all day long. Hydraulic controls have arrived—fewer parts—easier maintenance—smoother performance.

EASY—FAST—ACCURATE

Heavy, rugged, all-welded steel frames are built into all WARCO Graders. Other parts and components are correctly proportioned to provide a Grader that does the work without hesitation. All blade functions operated by Hydromotors. Even flow of power develops superior grading.

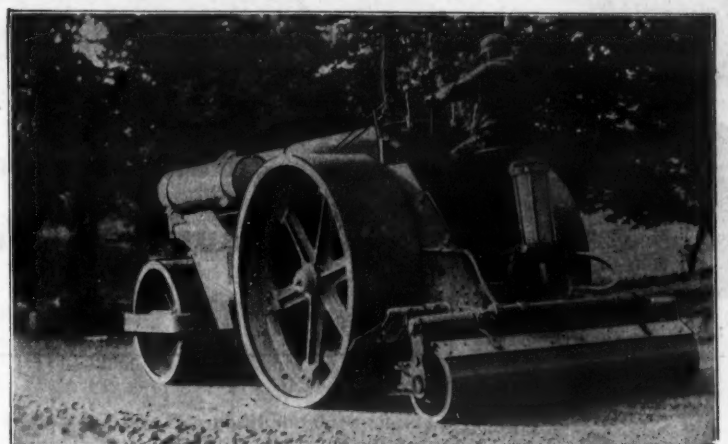
Distributors throughout the nation. Descriptive bulletin on request.

W. A. RIDDELL CORPORATION

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HERCULES ROLLERS AND *IRONEROLLERS*

Noted for their low operating and maintenance cost over a period of 15 years. The first HERCULES is still doing a fine job!



DEPENDABLE—ECONOMICAL

The HERCULES *Ironeroller* combines two types of rollers in one—the three-wheel and the tandem. It is a leveling roller. Eliminates cross-rolling, saving time and expense. Excess compaction is automatically prevented by the simple Hydraulic Equalizer on the *Ironeroller*.

Distributors all over the nation. Explanatory bulletins available.

HERCULES ROLLER COMPANY

BUCYRUS—OHIO

Unusual Dam in Peru Built Earthquake-Proof

Unique construction to prevent cracking by earthquakes characterizes the Autisha Dam now being built on the Santa Eulalia River, 50 miles east of Lima, Peru. At the point chosen for the site of this structure, the Santa Eulalia River pours through a crack in the mountain, apparently caused by some seismic disturbance. This irregular crack is about 1,300 feet long, 500 feet deep, and from 18 to 65 feet wide. Into the river bed, at the bottom of the gorge, a solid block of concrete has been poured, carried down to bedrock some 55 feet below the river bed and up between the rock walls to a height of 90 feet. The cross section of this plug in the gorge is roughly quadrangular.

On this foundation the dam proper is being built in the form of two butterfly-shaped columns each 216 feet high. At the center point, where these two sections would ordinarily meet, and where the body of the butterfly would be, a space

6 inches wide and 10 feet long has been left. This interstice is the key point in the dam design, to permit the two monolithic halves to move without cracking in the event of an earthquake.

To close this opening and keep back the water, a 10-inch iron pipe has been suspended down the length of the aperture on the upstream face of the dam. This pipe, which rests against two I-beams set vertically in the face of the dam, is filled with concrete and will be pressed into the 6-inch space by the pressure of the water on the upstream side.

Halfway through the 10-foot-long space there is a shaft or well, a little over 3 feet in diameter. On the downstream side of this well, there is suspended a V-shaped copper sheath forming an expansion joint and closing the crack. This flexible sheath will prevent the passage of any water which may seep past the pipe and the shaft will also provide a passage for the inspection of the interior of the dam.

This dam is being completed in two

sections, the first to rise about 256 feet above the river bed to impound 1,500,000 cubic meters (approximately 396,300,000 gallons) of water, and the second to 328 feet to impound 9,000,000 cubic meters. A diversion tunnel nearly 2 miles long will carry the water under a head of 915 feet to the power station in the valley below.

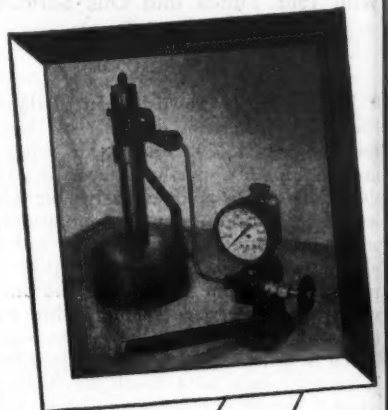
According to a recent issue of *Foreign Commerce*, the total costs of this project, including the two stages of construction and the connecting highways, are estimated at between \$5,000,000 and \$6,000,000. When completed, the plant will have a capacity of 30,000 kw.

Wall Chart Aids Care Of Heavy-Duty Tires

Seven basic rules for the care and conservation of heavy-duty tires, either of natural or synthetic rubber, are graphically pictured in a wall chart prepared by The B. F. Goodrich Co., Akron, Ohio. The danger to precious tires by overloading, high speed, over and under-

inflation, and incorrect installation and driving procedures are shown in the illustrations which will serve as a graphic reminder to both operators and owners of the need for constant tire care.

Copies of the wall chart, in reasonable quantities, may be obtained gratis by request to the company. Just mention this item.



IF IT'S A RODGERS IT'S THE BEST IN HYDRAULICS



NO. 19 OF A
"READY-WITH-A-RODGERS" SERIES



**"OUR RODGERS TAMED THAT
BULLDOZER IN 4 HOURS FLAT!"**



"The first job our Rodgers Track Press did for us opened our eyes. It was on a bulldozer that needed new track bushings—a job that used to take at least a couple of days.

"In four hours flat, that bulldozer was all fixed up snug and tight with new pins and bushings, ready to go to work. We don't mind track repairs any more—our Rodgers takes 'em all in stride."

This experience is typical—maintenance men agree that the Rodgers Track Press shortens layups for tractor repairs—saves time and money. It will pay you to get the full story on the Rodgers Track Press... write or wire for complete information and prices. *If it's a Rodgers, it's the best in hydraulics.* Rodgers Hydraulic, Inc., Dept. A-10, St. Louis Park, Minneapolis 16, Minnesota.

RODGERS HYDRAULIC, Inc.



**KEEP DIESEL ENGINES
RUNNING AT PEAK EFFICIENCY**

With this sturdy, portable, lightweight Adeco Nozzle Tester, any mechanic can easily make quick, accurate tests on injector opening pressure, spray pattern, etc. and detect stuck needle valves and leakage around valve seats. Adeco advantages have made this America's most widely used nozzle tester. Tests both large and small injectors, on bench or engine. Avoids costly delays and possible damage to engine. Keeps diesels operating at peak efficiency.

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EQUIPMENT CORPORATION**

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Sales Executive Available

Former executive of well-known road machinery company with unexcelled dealer and highway department contacts, coast to coast, is interested in the brokerage, or charge of sales and dealer organization, for a manufacturer that wants effective post-war set-up.

For further details or interview,
Address Box 252
Contractors and Engineers Monthly
470 Fourth Avenue, New York 16, N. Y.



Pumps and Kettles Vary in Shipments

Wartime use of pumps, including centrifugal, diaphragm, triplex piston rod, and plunger types, both gasoline-engine or electric-motor driven, resulted in increased shipments in the 1937-43 period, according to data from the War Production Board. Centrifugal pumps shipped in 1941 more than doubled the average of the preceding four years, and 1943 shipments in turn were 37 per cent over the 1941 total. Diaphragm, triplex piston and plunger pumps showed comparable increases up to 1941 but declined slightly in 1943, as shown in the following tabulation:

Year and Quarter	Pumps Shipped		
	Total	Centrifugal	Other Types
1937	9,877	588	10,435
1938	10,399	527	10,926
1939	12,471	813	13,284
1940	14,230	764	14,994
1941	24,993	1,790	26,783
1943	34,244	1,705	35,949

Unfilled orders for centrifugal pumps during the period December 31, 1942, to December 31, 1943, remained fairly stable while unfilled orders for other types at the end of 1943 were nearly 50 per cent greater than shipments for the year. Comparative figures follow:

Year and Quarter	Unfilled Orders—Pumps		
	Total	Centrifugal	Other Types
1942—4th	17,693	430	18,123
1943—1st	18,464	672	19,136
2nd	16,915	268	17,183
3rd	15,879	385	16,264
4th	16,633	2,233	18,866

Figures are available for the first quarter of 1944 on shipments of bituminous heating kettles, wheel, skid or leg-mounted, which indicate a 24 per cent decrease in comparison with the corresponding period of 1943. On the other hand, unfilled orders for the first three months of 1944 show an increase of 55 per cent. Here are the figures for 1937 to the first quarter of 1944 inclusive:

Year and Quarter	Bituminous Heating Kettles	
	Shipments	Unfilled Orders
1937	2,331	2,227
1938	2,227	2,145
1939	2,145	2,763
1940	2,763	4,250
1941	4,250	2,811
1943	2,811	

Available figures on a quarterly basis are:

1942—4th Quarter	740
1943—1st	761
2nd	835
3rd	790
4th	425
1944—1st	575

The foregoing statistics represent approximately 100 per cent of the respective industries.

Conveyors and Loaders For Material Handling

Portable belt conveyors for low-cost handling of all types of loose materials, and portable bucket loaders of various types and sizes are described in Catalogs 758 and 759, respectively, issued by the Jeffrey Mfg. Co., 970 N. 4th St., Columbus 16, Ohio. Both catalogs give complete descriptions and specifications and include illustrations and explanatory diagrams showing the operation of each piece of this equipment.

Copies of this literature, to aid in the solution of your materials-handling problems, may be secured upon written application to the manufacturer.

Jaeger-Lembo Expands To Meet Post-War Needs

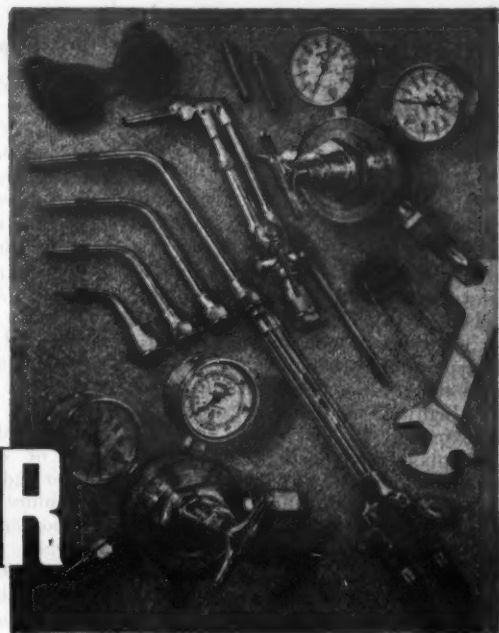
The building and property, consisting of 25,000 square feet, at the corner of 127th St. and Northern Blvd., Corona, Long Island, N. Y., has recently been purchased by the Jaeger-Lembo Machine Corp. Joseph C. Lembo, President of the corporation, has announced that this additional space is needed since the firm has acquired new lines which they will sell immediately after the close of the war. The building will be used for parts and service, repair shops, etc., and has an 8,000-square-foot showroom on the first floor.

The Jaeger-Lembo Machine Corp. is the exclusive representative in the New York and New Jersey area for the Jaeger Machine Co. of Columbus, Ohio, as well as of the Jaeger Marine Equipment Co., C. S. Johnson Co., Lakewood Engineering Co., Diamond Iron Works, Warsop Sales, Inc., Electric Taper & Equipment Co., Whiteman Mfg. Co., and Red Star Products, Inc.

You can't work with prima donnas . . .

A welding and cutting outfit which fails in an emergency is too great a luxury to own. Sure, VICTOR costs a little more to buy...but it costs so much less to own.

VICTOR EQUIPMENT CO.
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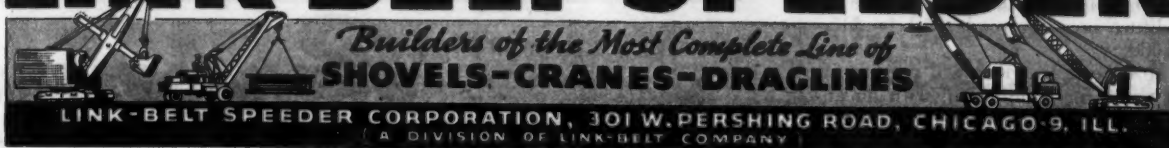
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(A DIVISION OF LINK-BELT COMPANY)

Canadian Provinces Announce Road Plans

(Continued from page 14)

of construction throughout. The estimated cost for completion is \$25,000 a mile.

For the secondary system of paved highways, an expenditure of \$23,775,000 is planned, to cover five different projects involving a total mileage of 951. The type of construction would be similar to that proposed for the three primary highways and the cost would be approximately \$25,000 a mile.

It is planned to spend \$27,920,000 on the remainder of the provincial highway system. This classification takes in 5,584 miles to be constructed and maintained to a substantially lower standard than the highways in the primary and secondary categories. Approximately 627 miles have not been graded to a standard above that of an ordinary municipal road and a large portion of the mileage constructed to provincial highway standards requires reconstruction to serve present-day traffic. New gravel surfacing is needed on 2,747 miles and gravel replacement must be undertaken on a further 2,837 miles, as well as reconstruction of practically all subgrade at present completed. The average cost of this work is estimated at \$5,000 a mile.

For colonization and mining development roads, it is planned to spend the sum of \$2,286,500. This project covers three routes, Prince Albert to Lac la Longe, Nipawin to Flin Flon, and Big River to Ile a la Crosse. Construction of the first of these roads was in progress but had to be discontinued on account of the war. The work required to complete it is the construction of 44 miles of subgrade at an estimated cost of \$4,000 a mile and the placing of 59 miles of gravel surfacing at an estimated cost of \$2,500 a mile. The roads from Nipawin to Flin Flon and from Big River to Ile a la Crosse are so far in the projected stage, the first having been fully surveyed, and the latter only partially. The standard of construction for all three roads is a subgrade with an elevation 3 feet above high-water level, with a crown width of 20 feet and 3 to 1 slopes, the subgrade to be surfaced with $\frac{3}{4}$ -inch gravel at the rate of approximately 1,000 cubic yards of gravel a mile.

Also included in Saskatchewan's \$87,805,000 post-war road program is provision for a highway-traffic bridge over the South Saskatchewan River and a number of highway and railway grade-separation projects. The estimated cost of this work is \$568,500.

The Alberta Program

In Alberta, post-war plans call for the expenditure of \$120,000,000 for roads and highways. The provincial highway system is to be increased from 3,800 to 6,000 miles, of which 3,000 miles are to be surfaced with asphalt or concrete and 3,000 miles with gravel or stabilized gravel. For this project alone, the estimated cost is \$83,000,000.

Alberta now has 2,000 miles of district highways, which will be increased to 4,000 miles. They will have earth and gravel surfaces and the cost, inclusive of all work and structures, will be \$15,000,000. About 500 miles of new hard-surfaced tourist roads through the national parks within this province are also projected at a cost of \$7,000,000. In addition, there are 40,000 miles of local and development roads which are to be increased to 50,000 miles. The expenditure on such roads will be \$15,000,000.

The Alberta program will require fifteen years for completion, with an annual expenditure of \$8,000,000, and is contingent on the Dominion government

agreeing to assist with the financing.

Program in Ontario

In Ontario, highway officials say that they have completed a post-war plan calling for the expenditure of \$150,000,000 but decline to release details until the Dominion government makes known what share of this sum it will finance. The plan is to cover a four-year period and, if adopted, is expected to give employment to as many as 45,000 men. Under it, additional main highways will be built, curves will be eliminated, grades will be improved, and many level crossings abolished.

In this province, the most heavily populated in the Dominion, highway traffic is of two types, local and tourist, and of equal volume. Because the larger industrial centers are located in proximity to the points of entry along the border from which the tourist traffic emerges, the highways that carry the bulk of local traffic must also handle most of the tourist traffic. This eliminates the need for two highway systems

designed to handle traffic of heavy density. The skeleton highway structure must, therefore, consist of express highways between the Quebec border, the U. S. border at Windsor, and the Niagara border to a point north of Toronto where northbound traffic dissipates itself by way of feeder roads.

At present, Ontario's system of "King's Highways", which are administered by the province, comprises 3,900

miles of paved roads and 3,700 miles of gravel and low-type-surface roads. Of the former, the most modern development is the Queen Elizabeth Way, a four-lane sodium-lamp-illuminated concrete express route from Niagara Falls and Fort Erie to Toronto. According to a recent announcement by the Minister of Highways for Ontario, extension of this highway from Hamilton to the U. S. border

(Concluded on next page)

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for DAVENPORT-FRINK SNO-PLOWS



Because of the necessity of clearing all Sno-Plow orders through Washington, we URGE the EARLY placement of orders for new Davenport-Frink Sno-Plows. Also we ask the early submission of repair part specifications to insure delivery BEFORE the snows come.

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joint, close doors and then place balance of batch wherever required.... Normal operating cycle is unchanged. No more split batches—you discharge a full batch into bucket every time. In cold weather, hydraulic fluid is freeze-proof. On your next paving job, use a Ransome 34-E Paver.



CONSTRUCTION EQUIPMENT DIVISION

Ransome MACHINERY COMPANY
DUNELLEN, NEW JERSEY

SUBSIDIARY OF WORTHINGTON PUMP AND MACHINERY CORPORATION

Canada Looks Forward To Post-War Highways

(Continued from preceding page)

at Windsor-Detroit is to form part of the province's post-war program, although details of the exact route it will take have not yet been revealed.

Ontario's remaining roads are administered by county and township authorities and total 19,300 miles. In the northern part of this province, the most pressing requirement, highway officials say, is the paving of hundreds of miles of gravel-surfaced roads.

British Columbia's Plans

British Columbia also has not yet seen fit to reveal its post-war highway plans, except in general terms. This province contemplates nine different road projects at a total cost of \$210,257,700. Of this sum, materials alone will absorb \$83,270,000. Altogether, the nine undertakings will cover 5,864 miles of highway, at an average cost of \$35,852 a mile.

These British Columbia road projects are: the Northern Trans-Provincial Highway, \$24,661,100; the Southern Trans-Provincial Highway, \$53,508,000; the British Columbia section of the Trans-Canada Highway, \$44,167,000; the Vancouver Island Highway, \$18,623,300; the British-Columbia-Yukon-Alaska Highway, \$23,709,300; the Cariboo Highway, \$15,458,800; the Vancouver-New-Westminster Express Highway, \$11,237,000; Parks Highways, \$11,858,900; and the North Thompson Highway, \$7,034,300.

New Brunswick's Program

The Deputy Minister of Public Works for New Brunswick, A. W. Barbour, has recently made known something of his province's post-war road-building program. In a statement to the author, he said:

"We have a definite highway program prepared for post-war work which will include the paving of the balance of our main trunk highway system, some 500 miles, and an additional 700 miles of secondary roads, as well as many bridges on these routes. There will be as well reconstruction of a large mileage of secondary and branch roads in order to bring them up to a better graveled standard. These projects will probably run into \$45,000,000 to \$50,000,000."

Other Provinces

The remaining provinces, Manitoba, Quebec, Prince Edward Island, and Nova Scotia, have also drawn up post-war road-building programs. However, officials report that these are "still under study" and are subject to modification, and there seems little possibility that details will be made known for several months.

Organization and Financing

In Canada, construction of roads suitable for motor traffic has been one of the principal items of provincial expenditure for the past 20 years. In the three maritime provinces of Prince Edward Island, New Brunswick, and Nova Scotia, all rural roads are under provincial jurisdiction. In Quebec, the province constructs and maintains all improved roads. In Ontario, the province subsidizes rural municipalities for highway expenditure when work is up to prescribed standards, and in the four western provinces the principal roads are under jurisdiction of the provincial governments.

So far the Dominion government has subsidized nine roads, the Trans-Canada Highway and certain other roads constructed by the provinces. The Dominion also constructs and maintains the roads in the national parks.

Canadian Highway Figures

The latest available figures show the total road mileage in Canada to be 123,000 miles of surfaced roads and 442,000 miles of earth roads. Of the surfaced type, 106,000 miles are gravel or crushed stone, 14,000 miles have bituminous surfaces, while 2,500 miles are of portland-cement concrete.

The total highway expenditure in Canada for the last reported year (1942) was \$62,800,000. This was made up of \$26,100,000 for road construction; \$1,700,000 for bridges; \$29,500,000 for road maintenance; \$3,200,000 for bridge maintenance; and \$8,900,000 for footpaths and sidewalks. The remainder was spent on administration and general expenses.

Eimco Branch Office

A new branch office of the Eimco Corp. of Salt Lake City, Utah, has been opened in the Paul Brown Building, St. Louis, Mo., under the management of James K. Russell.



Contractors find this
CLARK PORTABLE LIGHT PLANT
"as handy as a pocket in a shirt"

Keep one handy to pour light any place, any time.

Use it on repair jobs—and for night loading and unloading.

Use it when other light sources fail.

Use it, too, when more light is needed.

And use it to power small tools—electric drills, sanders, etc.

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SPECIFICATIONS: The light plant consists of 1 portable generating unit (1-hp. air-cooled gasoline engine driving a 500-watt 135-volt direct-current generator) mounted on an all-steel hand truck; 2 portable service lights (250-watt and 150-watt); a 150-watt spotlight; three 20-foot extension cords, and a 1/2-gallon gasoline tank supplying the plant for four full-capacity hours.

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For Air Economy USE *Thor* ROCK DRILLS

AIR INPUT Measured
to .00025 of an inch for
Balanced Power and
Smooth Performance.

Spaces between the flanges and chest
shoulders of this patented Thor Valve
are controlled to a tolerance of .00025
of an inch to turn into power ALL air
that enters the tool.

● Thor Rock Drills develop rock-smashing power and speed from every ounce of air that enters the machine through the patented Thor Positive Short-Travel Tubular Valve which controls air power by tolerances of .00025 of an inch!

Balanced power is one feature of such fine control—because only a precisely governed quantity of air is allowed behind the piston.

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Thor Rock Drills offer many more features of design and construction—features providing complete control of drilling speeds, assuring dependable rotation, preventing clogging, and absorbing shock. For complete details about Thor Rock Drills and a wide range of associated air tools write today for Thor Catalog 42-A.



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Branches in Principal Cities

New and Used Tires For Distribution Now

Despite the word from various agencies that there would be no increase in tires for civilian use of any kind, a release from the Office of Surplus Property, Procurement Division, Treasury Department, dated September 2, 1944, does give hope that some new and used surplus truck tires may be available.

Ernest L. Olrich, Assistant to the Secretary of the Treasury, announces a unique plan of redistribution of surplus tires, which provides for national distribution and has just been tested in the disposal of 70,000 tires declared surplus by the Army.

A group of 25,000 new and 31,000 used small truck tires were sold back to twenty-three of the twenty-six tire manufacturers in the United States, each receiving an allotment based on their usual replacement business. These manufacturers will in turn pass them on to

regular distributors, thus assuring a wide distribution. This plan will be followed by the Automotive Division of the Office of Surplus Property as other tires become available as surplus.

All tires are being sold under existing regulations of the Office of Defense Transportation, the Office of Price Administration, and the Rubber Director's Office. The spokesman also stated that there were no immediate prospects of surplus tires in larger sizes as there is still critical military need for them.

Another group of 14,000 tires was sold to other Government agencies. Among those participating in the purchase of these were the Navy, Department of Interior, Department of Agriculture, and Lend-Lease.

Tractor-Mounted Crane

The full-revolving Handi-Crane, for mounting on Case Model DI wheel tractors, is fully described and illustrated in

a four-page folder just published by the Industrial Equipment Co., 59th & Doyle Sts., Emeryville 8, Calif. In addition to its speed, this Handi-Crane is reported by the manufacturer to possess a high degree of maneuverability and a rugged

extra frame which eliminates strain on the tractor transmission housing or engine case.

Interested contractors and highway engineers may secure copies of Bulletin H-101 upon request to the manufacturer.

NM-7405 Hour Meter installation driven by oil pump gear on compressor engine.

Hour Meters —

Equipment Speedometers



Model NM-7429 For magnet equipped engines with SAE type A or B distributor mounting.

PRODUCTS METERS
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register actual running hours of an engine... obtained thru the conversion of an average crankshaft speed into hours of running time. Indispensable... for securing service records such as oil and gas consumption, maintenance, repairs and replacements. Indispensable... for maintaining expensive equipment at highest efficiency; for estimating costs and basing rental charges.

Hour Meters are compact, accurate, easily adaptable to different types of engines. Complete details in

Catalog No. 20

DURANT MANUFACTURING COMPANY

1976 N. Buffum Street • Milwaukee 1, Wisconsin



Six wheelers and heavy duty trucks.



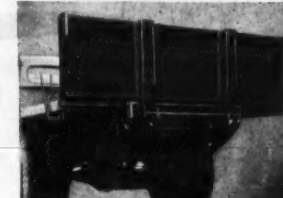
For short and long W. B. chassis.



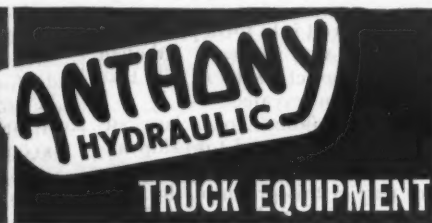
Special for wooden bodies.



Stake or platform bodies.



Solves manpower problem.



"SUPER" HYDRAULIC HOIST DUMP BODIES

sizes 5 to 30 ton capacity.

MODEL "ZB" PLATFORM HOISTS

make dump bodies out of flat-bed, stake, or grain bodies.

"STAKE BODIES"

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Lengths up to 20 feet.

"LIFT GATE"

HYDRAULIC tailgate lift for loading truck van bodies, platform bodies, etc. One man does the work of three!

Write or wire for literature and prices Nation-wide Sales and Service

ANTHONY CO.
STREATOR, ILLINOIS



DUFF-NORTON Jacks



husky helpers for every JOB

LIFTING
LOWERING
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You get maximum efficiency with Duff-Norton Jacks on the job helping with the heavy lifting and moving. These husky Jacks are built to take the roughest, toughest kind of service, yet they're easy to spot and operate. Count on Duff-Norton Jacks for safety and dependability on every construction job!

WRITE FOR CATALOG

There's a Duff-Norton Jack for every job—and Catalog 202 gives you full details on every model and size. Write now for your copy.



DUFF-NORTON Jacks
are "Mechanical Muscles" for
every job of lifting or moving.

THE DUFF-NORTON MANUFACTURING CO.
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Paper Goes to War

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- * 700,000 different kinds of items are shipped to the Army—and they're paper wrapped or boxed.
- * "K" ration containers, shipped from the Eastern Seaboard alone, take 662 pounds of paper a month.
- * Each Signal Corps Radio set takes 7 pounds of kraft paper, 3 pounds of book paper.
- * Each propelling charge for 155-millimeter shell takes 3/5 pound of paper.
- * Each 300-pound bomb takes 12 pounds of paper for rings, tops and bottoms.
- * A fiber container for a 75-millimeter shell takes 1.8 pounds of paper board.
- * Each weapon part must be wrapped in greaseproof paper and in waterproof paper. A single shipping case of decontaminating apparatus requires 273 square feet of waterproof lining paper.
- * All kinds of paper are used by the Army, from vegetable parchment, .0015 inch thick, to heavy paper board and wall board.
- * All Army clothing and equipment are shipped in waterproof paper wrappers.
- * Multiwall paper bags are used extensively in shipping flour and dehydrated foods.
- * All openings and exposed surfaces of tanks are sealed with paper for shipping.
- * Submachine guns are not only paper-wrapped but boxed in paper board. Shell grommets, bomb rings and practice bomb fins are made of paper to save needed steel.

Pile Dikes Protect Rio Grande Levee

Weakened Levee Sections Enlarged and Strengthened; Runways for Pile Drivers Built by Portable Dredge

† A CONTRACT for levee protection structures on the east bank of the Rio Grande south of Albuquerque, N. M., was performed for the U. S. Engineers during 1944 by Stavelly & Kendall of Kansas City, Mo. The work was scattered over approximately 30 miles of river between Albuquerque and Belen and consisted of both single and double-pile dikes, with tie-backs, and a moderate amount of earth work in straddle enlargement of the existing levee.

Earth Work

At scattered locations the old levee was low and weak, due to erosion, silt deposits which raised the river bed, taking material from the levee section to fill sand bags during floods, and its use as a roadway, so that it was necessary to strengthen these portions by additional fill. Three 12-cubic-yard LeTourneau scrapers pulled by two Caterpillar RD8 and one D8 tractors, one 6-cubic-yard LeTourneau pulled by an Allis-Chalmers Model L, and two 16-cubic-yard Gar Wood scrapers pulled by Allis-Chalmers HD-14 tractors moved the dirt while an RD6 and RD8, both equipped with LeTourneau bulldozers, assisted in spreading it and were used for clearing and pushing where necessary.

Due to the specifications which restricted the excavation of river-side borrow pits to sections where the distance between the toe of the levee and the river bank is 100 feet or more, and to the comparatively high water table, the securing of material was something of a problem and in some cases necessitated hauls up to 3,000 feet. Borrow pits were required to be excavated at right angles to the river channel, a maximum of 25 feet in width, and have a berm of undisturbed dirt 25 feet wide left between them. The water table in some areas was at ground elevation and was seldom more than 2½ feet below the surface. This seriously limited the depths of pits, because the contractor was not allowed to excavate below the water table and leave free water standing in pits in violation of mosquito-control measures.

A Chevrolet-mounted Graco Convoy Luber handled the lubrication on the job and a Chevrolet ½-ton truck carrying a 100-gallon fuel tank serviced the

equipment. Air for tires was furnished by a small compressor mounted on a wheelbarrow frame easily moved by one man. One 12-hour shift was operated, and due to the necessity for frequent moves and the difficulty of securing borrow material no high production figures were set.

Job-Built Portable Dredge

Because of the fact that a considerable portion of the pile dikes was located on ground which was under shallow water in the existing river channel, the contractor considered it economical to dredge sand from farther out in the channel and use it for a fill, placed on the line of the pile dikes, on which he could move and operate his pile-driving equipment. Since the areas where this



U. S. Engineers Photo
This portable dredge was used by Stavelly & Kendall to place sand along the line of the pile dikes on the Middle Rio Grande levee protection project near Albuquerque, N.M., to furnish roadways for the pile-driving rigs. It was disassembled and hauled from one location to another by truck.

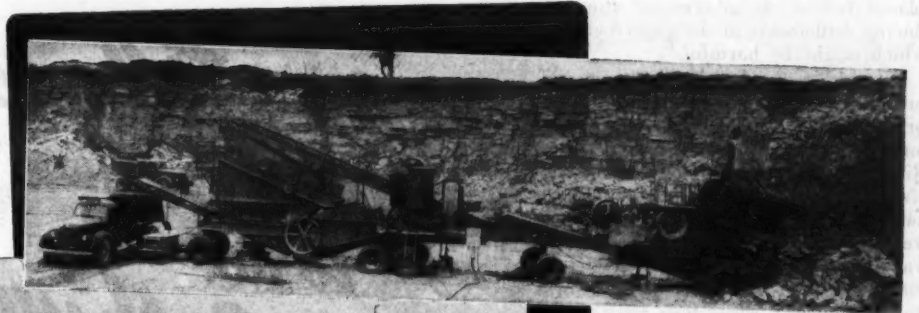
operation was necessary were widely scattered and the water in the river was insufficient for the movement of a heavy floating dredge, it was decided to build a portable dredge, floating in operation, but easily brought ashore, disassembled, and transported by truck to the next point of use.

A wood platform of 3 x 12-inch lumber on 4 x 4-inch cross members on 18-inch centers was supported in the water by sixty-eight steel oil drums. Shear frames of 6 x 6-inch timber carried the 6 to 10-foot suction line and the barge end of the discharge line which was

(Continued on page 70)

J. A. Gallagher, Madison, Wisc., contractor uses a Universal 546-P primary unit with 20" x 36" jaw crusher in Viroqua, Wisc. quarry. Plant is electric-powered.

Below: Ben & Sons use a 546-P primary unit with 20" x 36" crusher for primary reduction of limestone at Ackley, Iowa. Secondary plant has No. 4 Universal Pulverizer.



The 30" x 42" Welded Steel Plate Roller Bearing Crusher on this 546-P Primary Unit increases output for Art Overgaard's No. 1 plant at Cashton, Wisc. This is the third 546-P unit purchased by this operator.

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Soils Studies Solve Foundation Problems

(Continued from page 19)

were as predicted. By planning for this increase in stress in the design of the structure, a saving of \$12,000 was effected.

A 200-foot box culvert on the same parkway was built on similar firm red clay with softer clay beneath. Piles were not used. The culvert settled 5 inches at the center and 1½ inches at the ends; expansion joints prevented cracking and \$5,000 was saved. Furthermore, omission of piles allowed the culvert to settle with the adjacent fill, so there are no bumps in the pavement. Highway engineers often do not realize that a 20-foot fill behind an abutment may cause as much settlement of the bridge footing as the weight of the bridge itself. Because of this, it is sometimes wise to set the structural steel after the fill has been placed behind the abutments, thus reducing settlements of the superstructure which might be harmful.

Another use of soil mechanics in bridge design is in connection with bridges built over rivers having deep mud deposits, such as the new Thames River Bridge at New London, Conn. The river piers extend 20 feet into the mud and are supported on long piles. Underwater excavation to the required depth was made inside the customary steel sheet cofferdams. However, before work was commenced, shear tests were made on undisturbed samples of the mud and an analysis made to ascertain whether the unbalanced "head" of mud would cause it to "blow" into the cofferdam during excavation. As a result of this analysis, the sheet piling was made 5 feet deeper than originally designed.

Further use of soil mechanics in bridge design is in the difficult and important estimate of lateral resistance of the soil to pier movement due to lateral wind load. Shearing strength and consolidation characteristics are used to calculate these resistances.

In the problems of earth pressures against abutments and retaining walls, the classical Coulomb and Rankine solutions have been found to be inadequate, being based on assumptions not in keeping with the facts. Some improvements in design have been made, but more data from experiments and actual practice are needed, because of the complicated nature of these problems.

In the design of weep holes and underdrains behind abutments and retaining walls, the type of backfill material around and above the drain is a soil mechanics problem that will be discussed in connection with roadway underdrains. The extent of such backfill is also a soil mechanics problem whose solution depends on the permeability of the earth fill. If the latter is silty or clayey, the underdrain backfill should of course be carried to the top of the seeping water (usually the top of the fill); preferably it should slope back from the drain, for seeping water exerts a pressure on the soil in the direction

of seepage. Furthermore, in a compacted fill, seepage is made more horizontal because of the horizontal layers.

Embankment Stability

The second main branch of highway engineering, roadways, has great use for soil mechanics. This use can be subdivided into stability of cuts and fills and stability of subgrade beneath pavements and shoulders. Modern highway design is producing larger cuts and fills and modern construction equipment is building these cuts and fills more rapidly than ever before. The result is that soil mechanics is often needed in designing and constructing these safely and economically, particularly the fills.

A frequent problem is a fill to be built on a soft foundation. Excavating the soil is often expensive because of the large yardages to be moved and replaced with borrow. Undisturbed samples of the soft soil are tested and analyses of stability against sliding are made. Often stage construction is resorted to, under the direction of the soil mechanics engi-

neer, so that the foundation can consolidate (and thereby strengthen) under a few layers of fill before subsequent layers are added to complete the fill.

A few states, notably California, have speeded the consolidation process on difficult projects by installing vertical drainage wells in the soft foundation prior to placing the fill. The foundation soil consolidates as pressure of the fill slowly squeezes out some of its pore water, and the wells are spaced closely enough so that the pore water can escape readily into them rather than by the longer path to the surface or to a possible sand stratum below. Gradually, soil mechanics is being recognized as a rather accurate means of solving such problems, but this recognition has sometimes resulted from costly and even tragic failures to heed the warning of the soil mechanics engineer.

A much more common and relatively trivial failure is local sloughing on slopes. This is due to the outward and downward seepage forces of excessive amounts of water percolating out of the

slope. Usually it can be remedied by digging a trench that intercepts the seeping water before it reaches the slope's surface and installing a drain in the trench, similar to an underdrain at a roadway. However, in mountainous country, landslides often occur on slopes. Generally these require a thorough knowledge of the geological conditions before engineering principles can be applied for the remedy.

Proper Compaction

A very important function of soil mechanics in connection with fills of clayey and silty soils is proper compaction of the layers. For a given type and weight of compacting equipment and a given number of passes over the layer, there is a moisture content of a soil which results in maximum density of the layer. Laboratory compaction tests approximately reproduce this compactive effort and yield curves which indicate closely the optimum moisture content for the soil in question. By using

(Continued on next page)

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Insuring Stability For Fills, Subgrades

(Continued from preceding page)

these tests and periodically sampling the completed layers, close control of the fill can be obtained, resulting in a dense fill. Occasionally excessive rainfall or a dearth of water makes such control and density unjustified economically, however.

Pavement Stability

Stability of pavements and shoulders is the oldest and most basic problem of the highway engineer. It dates from the time it was first said, "We must get the state out of the mud". The best means of achieving this is drainage or substitution of good soil for poor soil in the subgrade. However, either or both may be expensive, particularly in areas of flat topography and fine-grained soils such as the Mississippi valley and the Great Plains.

Symptoms of instability are numerous. They include curling at joints and cracks of pavements laid directly on clays that expand and contract greatly with changes in water content. Water enters or evaporates through these openings, causing radical changes in the clay and movement of the pavement at these points.

Another type is the frost heave and subsequent frost boil in our northern states. This is due to freezing of the capillary moisture in a silty or clayey soil in thin layers (lenses); the adjacent soil, having yielded some of its moisture to the ice lenses, sucks up more moisture from a nearby supply (such as ground water) and this moisture in turn is yielded to the ice lenses to make the lenses thicker. Subsequently, in the spring, the upper part of the frost zone melts before the middle part; being "decompacted" by the ice lenses and being supersaturated by the water of the melted lenses, a frost boil is created. Since the soil is silty or clayey, its excess moisture does not escape laterally with any rapidity, and the result is a "soupy" condition. The moisture frequently is pumped to the surface and makes an icy pavement if the temperature drops.

Another situation which often is found in our older roads in clay areas results from failure to carry the sub-base under the shoulders and out to the gutter or fill slopes. In such cases, moisture which seeps down into the sub-base cannot escape to the sides and it remains to saturate the clay subgrade. Consequently, the pounding of traffic on the pavement gradually pushes the sub-base aggregate into the softened clay, remolds the clay by breaking the "clay structure", and works down into the clay while the softened clay works up into the sub-base and ruins it.

When good soil is to replace poor soil, both should have been tested, if necessary, to determine their permeability (or drainage qualities), capillary powers, and frost-heaving quality. When an underdrain is to be installed, an additional test is often necessary to determine whether the underdrain backfill is sufficiently fine to prevent the seeping water from carrying the soil into the backfill and clogging it. It is now known that backfill composed of screened 3/4-inch or larger stone has become clogged in such a large percentage of cases that its use is inadvisable except in special cases. In the fields of subsurface drainage and frost heaving, the soil mechanics engineer has contributed much of value.

Subgrade and Stabilization

The question of pavement thicknesses for various soil foundations and various wheel loads has long been a difficult one. The advent of large trucks and, recently, large bombers has stimulated investiga-

tion. At present, design is based chiefly on field data correlated to empirical formulas. Application of theoretical soil mechanics is confined chiefly to approximating the stress distribution by means of the Boussinesq and other solutions. However, it is probable that in a few years most states will vary their pavement and sub-base thicknesses according to soil conditions and thus effect economies in construction and maintenance.

Another very important subject is the stabilization of soils for pavements and base courses by admixtures, such as fine or coarse soil aggregate, bitumen, portland cement, calcium or sodium chloride, etc. In our larger and more rural states, longer mileage and lighter traffic prevail; consequently, soil stabilization is especially important there. It is not pure soil mechanics, but involves knowledge of the artificial road materials. For this reason and because of the numerous and complex factors present in stabilization problems, it will not be discussed here.

(Concluded on page 81)

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(Taken from Public Roads, August, 1939)

TYPE OF JOINT	Spacing of Tie Bars Inches	Diameter of Bars Inches	Joint Efficiency Per Cent
Triangular Tongue and Groove.....	60	1/2	75
* Rectangular Tongue and Groove.....	60	1/2	78
Rectangular Tongue and Groove.....	None	—	50
Butt	24	3/4	52
Butt	36	3/4	42
Butt	48	3/4	51
Butt	60	3/4	47
Dummy	60	1/2	44
Dummy	None	—	39

* Keystone Tongue and Groove type joint.

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Send for illustrated specification manual
showing methods of installation.

Road Improvement In Conn. Township

(Continued from page 33)

obtained from a local bank which happened to be equidistant from both ends of the section under construction so that graveling proceeded from the center outwards, thus subjecting the roadway to compaction from the six 3-yard trucks used on the job. The gravel was spread from the trucks and grading was done by a Warco tandem-drive Model 3 grader powered by an International engine. The trucks were rented for \$2.50 per hour and the grader at \$3.50 per hour.

Common labor received 75 cents an hour, power shovel operators \$1.60, and grader operators \$1.00 per hour. Thus the \$6.50 per hour for the shovel was made up of \$1.60 for the operator, \$4.18 for the equipment, and 72 cents for gas and oil, while the \$3.50 for the grader was made up of \$1.00 for the operator, \$2.00 for the equipment, and 50 cents

for gas and oil.

The section was later treated with oil at 10 cents per gallon applied. The first treatment was from $\frac{3}{4}$ to 1 gallon per square yard, while the subsequent one was but $\frac{1}{3}$ to $\frac{1}{2}$ gallon per square yard.

In North Eagleville 5,000 linear feet of road, and 7,000 linear feet in North Windham were the other two projects completed in the same biennium.

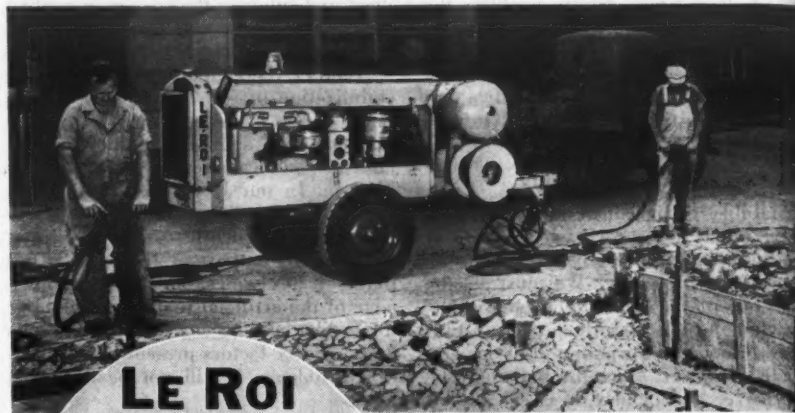
Report on Conference On Post-War Road Plans

Proceedings of the Conference on Plans for Post-War Highways, which was arranged by the Department of Civil Engineering through the Division of University Extension, University of Tennessee, and was held at the University May 12-13, 1944, have been published in a 92-page issue of the University Record. All the papers presented at the meeting are reprinted, covering a variety of subjects pertaining to post-war highways, including the use of aerial

photographs in highway location and design, various aspects of airport and Flight-Strip construction, and highway financing, as well as technical discussions on the resistance of concrete to freezing and the composition and use of stabilized-gravel and crushed-stone

bases. Photographs, maps and charts illustrating the various papers are included.

Copies of this report may be secured free by those interested direct from the Division of University Extension, University of Tennessee, Knoxville, Tenn.



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Highway Maintenance Increased in West Va.

Heavy Trucking Takes Toll Despite General Traffic Drop; Spot-Sealing Is Feature of Regular Program

By E. L. WORTHINGTON, State Maintenance Engineer, State Road Commission of West Virginia

THIS year the maintenance program of the State Road Commission of West Virginia will exceed that of the past two years, as well as the pre-war years, both in expenditure of funds and in the number of miles of road actively maintained. This increased expenditure may appear inconsistent in view of the fact that traffic, as a whole, has decreased approximately 35 per cent in West Virginia as compared with 1941, the last year of normal traffic. However, the nature of the traffic has changed and, although there is less travel, present-day traffic consists of larger vehicles with heavier loads.

West Virginia does not have many large war industries or plants and does not have any large Army cantonments to increase war traffic, but the strategic location of the state, between the sources of raw materials in the south and the manufacturing plants in the north, makes West Virginia's roads the pathway over which this material has to be transported. Furthermore, there are at least 200 strip coal-mining operations in West Virginia, all actively engaged in the production of coal which is vital to the war effort, and it is reliably estimated that between 8,000,000 and 9,000,000 tons of coal will be produced by these strip mines this year. Most of this tonnage is being transported over some part of the highway system and the fact that these loads are heavy, coupled with the fact that many of the routes used are secondary farm-to-market roads which were not designed for this type of traffic, has resulted in much damage to pavement surfaces, thus adding to the maintenance problem. A considerable amount of coal from deep and drift mines is also hauled by trucks using the highway system.

West Virginia is also one of the leading states in the production of oil, gas, pulp-wood, mine props and other types of timber, and the transportation of these commodities has increased highway use. While all of this increased hauling has not kept the state-wide average traffic up to the pre-war figure, it has resulted in a concentration of heavy hauling on a substantial portion of the highway system with the resultant out-of-proportion necessity for highway maintenance.

Maintenance Expenditures

During 1944, approximately \$8,000,000 will be spent for highway maintenance, as compared with an expenditure of \$7,288,029.38 during 1943, and an average expenditure of \$7,500,000 during the immediate pre-war years.

Of the \$8,000,000 expenditure, approximately \$5,000,000 will be spent on routine maintenance on the entire highway system, which consists of 4,791 miles of primary roads and 28,272 miles of secondary roads. This routine maintenance consists of patching bituminous surfaces, dressing shoulders, cleaning ditches and drainage structures, cleaning roadsides, cutting weeds, placing center-line stripes, maintaining traffic signs, repairing and painting bridges, blading earth and traffic-bound roads, removing slides, snow removal and ice control, and similar items. Minor repairs to equipment are also paid for out of this regular maintenance fund and amount

to about \$450,000 a year. During 1943 and the three or four preceding years, approximately this same amount was spent for routine maintenance.

From the remaining \$3,000,000, about \$250,000 will be spent for major overhaul of equipment, the purchase of new equipment, roadside-development activities, and other more or less extra items. This leaves \$2,750,000 which will be spent for the most part on active special maintenance of bituminous surfaces, such as resurfacing work including light seal treatments, light and heavy surface treatments, and retreads; adding stabilizing material to weak spots on traffic-bound roads; remedial work on large slides; and major repair work on large bridges.

This special maintenance work will

involve approximately 1,000 miles of primary roads and 750 miles of secondary roads, using 5,250,000 gallons of bituminous material and 260,000 tons of aggregate. In addition, about 50,000 tons of bituminous concrete will be used in resurfacing work. This will involve about 1,000,000 gallons of bituminous material and 50,000 tons of aggregate more than was used during 1943 and the immediate pre-war years.

Man-Power and Contract Work

The man-power situation has affected the West Virginia maintenance program in two principal ways: (1) We are not able to do the work as effectively as usual, due to the lack of properly trained men; (2) The work costs more per square yard due to the lack of trained men and higher labor costs. There is a definite lack of labor in many counties and particularly of trained equipment operators.

To aid in the solution of this problem, eighty-three bituminous surfacing projects were contracted this year, the aver-

age length of which is 7.12 miles. During 1943, forty-six such projects were contracted, with an average length of 10.83 miles.

Specifications for the contract work call for furnishing sufficient material for patching and leveling and an application of a tack coat of bituminous material prior to the placing of the surface treatment, and also for a finished surface which has a fine-grained sandpaper-like finish which provides skid resistance while sealing out water and air, the two most deteriorating elements.

Spot-Sealing Avoids Patching

In order to preclude as far as possible the necessity for patching holes in bituminous surfaces and to prevent deformation of the surfaces, a spot-sealing program is conducted the year round. Road surfaces are carefully watched for signs of checking or alligatoring and as such areas develop they are immediately given an application of light tar RT-5 at the rate of 0.1 to 0.15 gallon per

(Continued on page 74)



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Inspections Extend Equipment's Service

(Continued from page 27)

yard main also feeds two double and one triple yard hydrants, adjacent to which are hose houses containing 200 feet of 2½-inch cotton rubber-lined hose with play pipes, spanners and wrenches. Inside the main service building are three standpipes, each equipped with 50 feet of 2½-inch hose, and in the laboratory building there is also a standpipe with 50 feet of 1½-inch linen hose on each floor; these are supplied by the yard main and tank. In addition, there are 2½-gallon fire extinguishers placed at convenient locations throughout all the buildings. Using an old truck, a yard emergency fire truck was constructed and equipped with ladders, hose, pumps, and extinguishers; in addition, a cable and hook arrangement was installed to allow the towing of cars, trucks and other equipment from the fire zone. A siren was installed also to be used in case of fire, to summon the yard personnel; the men have been trained in the use of the equipment and a regular weekly inspection is made to insure its good condition. As a guard against fire hazard, a brick incinerator, of approved construction, has been built for the burning of all waste and rubbish, which is collected regularly, removing a hazard which formerly existed when waste materials were burned in the open.

Inspection Practices

Under the direction of the Chief Inspector of Highway Equipment, a corps of field inspectors operates throughout the five districts and through them cases of defective equipment are sent to Fernwood for repair and reconditioning; likewise all cars and equipment coming to the Fernwood station are examined and motors, bodies, equipment and tires are checked. Any need for minor repairs thus found is taken care of immediately. This has resulted in a considerable saving in money and time in preventing the necessity of major repairs later, or possible breakdown. Formerly, in many cases, equipment conditions awaited the report of the driver or operator before repairs were made, and in most instances a major repair job was necessary. Likewise, before a piece of equipment, sent to Fernwood for repairs, leaves the station, a rigid and thorough inspection is made of the entire piece by the inspection department and it must be in first-class condition before it is permitted to be returned to service. While this has increased the number of inspections and minor repairs, it has resulted in a considerable saving in money and increased performance hours.

Conservation of Rubber

In its conservation practices, the Department has made a special effort to restrict the need for new tires and has cut down mileage as much as possible; this has occasioned considerable detail work in rearranging the schedule, but the results shown have been well worth while. In 1942, the mileage covered was 502,521 miles; in 1943, this was cut to 295,360 miles, a saving of 207,161 miles. In addition, this figure of 295,360 was 35,988 miles less than the mileage allotted to the division under the war ration set-up. In the saving of tires, the results were just as impressive. In 1941 and 1942, the new tires used were 1,858, while in 1943, only 417 new tires were allocated to equipment. The number of recapped tires in 1941 and 1942 was 577; while in 1943, 479 tires, almost as many as in the two previous years, were recapped, showing a saving of approximately 56 per cent over the average of the preceding two years in new tires and an increased recapping percentage of

166 per cent, a worthy salvaging of tires that might otherwise have been taken from service.

Use of Trucks

The arrangements for the adaptation of trucks purchased for snow-removal work to all-year use are of interest. The Department has six FWD trucks, and eight Walter Snow Fighter trucks, which were originally acquired for snow activities. These are all heavy-duty four-wheel-drive units. The FWD trucks were originally equipped with rotary snow plows but were changed in all but one case to center V-type plows when it became apparent that the latter type was best suited to the demands of recent winter conditions. However, one rotary was retained against an emergency; the others, together with their dual engines, were placed in stock, are kept under continued maintenance, and can be put in service in the course of several hours if needed.

The Walter trucks were all equipped with large off-center V-type snow plows

and further provided with large outrigger wings to cut down snow piled at the side of the road, and also equipped with a supplementary plow blade 12 feet in length placed under the center of the truck chassis and adapted for closely clearing and scraping the roadway after the snow has been removed by the forward plow. These units have shown remarkably fine results in operation under heavy snow conditions. These, and also

the FWD trucks, are all provided with hydraulic control of plows, blades and other equipment, rendering the handling of such large units very easy and efficient.

During the average eight months when the units are not required for snow activities they are, with two exceptions, in use, having been equipped with dump bodies and are used in cases where heavy

(Concluded on next page)

IMMEDIATE DELIVERY

UNIVERSAL Level-Transit

Telescope 12" long, 25 power—Horizontal Circle 4¼" with vernier to 5 minutes—Vertical Arc 3"—Clamp and Tangent Screw for Vertical and Horizontal Limb—Instrument weighs 11 pounds, tripod 9 pounds.

Price complete with Tripod, Carrying Case, Sunshade, and Dust Cap \$115.00. Can be furnished with a compass at \$12.50 extra—Stadia Wires \$5.00 extra.

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HUBER
Franchise desirable. Why not
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THE HUBER COMPANY • MARION, OHIO, U.S.A.

N. J. Shops Maintain More Than 2,100 Units

(Continued from preceding page)

trucks are desired. By this dual service their cost and overhead are being amortized in a much shorter time and they are credited with a large number of performance hours.

The majority of the large dump trucks, used for year-round service, are hydraulic-equipped and are used in winter activities as well as during the open seasons. These power the snow plows which are attached to them by being bolted to the chassis and operated by hydraulic jack and chain attachments. Several types of plows are used, including Good Roads Models 101 and 112 (EF Mack type). During the summer the plows are inspected and reconditioned, and given at least one coat of paint, at Fernwood and are then distributed to the various other stations prior to the winter season. In addition to the plows, the trucks also power the sand and cinder spreaders, attached in the same manner, used for safety protection against roadway ice. This equipment replaced the former means of cinder spreading by hand from open trucks. Over 700 plows and spreaders are inspected, and completely serviced and reconditioned each year.

The mechanical efficiency and ingenuity of the shop management at Fernwood are shown in the arrangement adopted in the case of water tanks for Mud-Jacking. Considerable quantities of water are required in this activity and formerly the water was handled by the use of trailer-type tanks. These are limited as to capacity and consumed time in being refilled off the job. To make the operation more efficient, heavy steel tanks were fabricated at the shops and were mounted on light truck chassis which had been retired from active use. The trucks were then equipped with self-powered pumps for filling the tanks, so they can be refilled by pumping from any stream or water supply on or adjacent to the job.

The Department maintains in service over 2,100 pieces of highway equipment and the continuous inspection and checking of these and the prompt servicing in the shops assure dependable operation. Each year obsolete or unused pieces are disposed of; discarded parts are salvaged in all cases and are either sold as scrap or reconditioned and stocked where usable. The use of the Mogul Metallizer in replacing worn metal in parts that would have been customarily discarded has resulted in a considerable salvaging of parts.

Equipment

The highway equipment in service for the New Jersey State Highway Department on January 1, 1944, totaled 2,176 units, as follows:

326 Passenger cars (Buick, Chevrolet, Ford)
400 Trucks (Chevrolet, Ford, GMC, Mack, White, FWD, Walter, and including following special types or equipment: 2 wreckers; 1 ladder; 3 sprayers; 14 compressors; 2 welders; 2 core drills; 2 bridge cutters; 2 water tanks; 1 cable body; 2 sprinklers; 1 crane and winch; 2 10-ton Lorain cranes; 1 rotary snow plow; 3 snow plows)
72 Power graders (Case-powered Austin-Western, Gallon and Rome)



Cleaning up with a truck-mounted blade plow on a state highway in New Jersey.

6 Tractors (10-ton Caterpillar)
8 Mud-jacks
36 Mixers (Ransome concrete mixers and Blystone bituminous)
18 Air compressors
5 Water wagons
18 Mowing machines (Worthington lawn tractors)
74 Mowing machines (McCormick-Deering, John Deere, J. I. Case, David Bradley)

55 Power lawn mowers
1 Mower (Osborne)
96 Air tools
1 Electric hammer
104 Tar kettles (wood-burning, 36; oil-burning, 68)
46 Pumps
13 Rollers (10-ton Austin gas; 10-ton Gallon gas; 3-ton Gallon gas)
6 Lime spreaders

182 Sand spreaders (Butler, Hyatt, Good Roads)
12 Spray outfits
7 Vibrators
28 Weigh batchers
6 Rotary screens
4 Snow loaders
4 Sweepers
3 Power buckets
8 Plows
17 Traffic-line markers
565 Snow plows
46 Miscellaneous equipment

Administration

The operation of all highway equipment, its care and maintenance, and the operation of the servicing garages and the repair shops of the New Jersey State Highway Department are under the direction of the Superintendent of Plant and Equipment, Frank C. Young, who maintains offices at the Fernwood Service Station. Assisting him, with offices at Fernwood also, are T. W. Emmons, Master Mechanic, who is in direct control of shop operations, and F. M. Devereaux, Assistant Superintendent of Plant and Equipment.

The Testing Laboratory, Electrical Division, and the Purchasing Division operate independently under their own directing personnel.



WITH EXPERIENCED OPERATOR

"Today it is still the favorite unit on the job", is the way one operator expresses his individual enthusiasm for his Isaacson Cable-Power Unit. Acquired before Pearl Harbor, it is giving continuous service on grueling construction work in the Pacific Northwest. "It's the best, yet", says another who operates a fleet of cable units. These are people who know equipment, value dependability, smooth operation and long service. The heart of cable operation to them is in the Cable Power Unit. A unit that holds its adjustments longer, eliminates tedious tuning-up periods, is simple in design and sturdily constructed is a big hit in these days of war time stress and crushing demands on tractor equipment. They can depend on their Isaacson Cable-Power Unit. It won't let them down.

Front mounted Isaacson Cable-Dozers give constant power although tractor master-clutch is disengaged and they allow rear end to be free for rear power-take-off equipment.

Isaacson "Model 100" Cable-Power Unit is rear mounted for Cable-Scraper operation and is another "hit" with skilled operators on earth moving projects.



See your industrial Tractor Dealer, he is qualified to assist you with your tractor equipment problems.

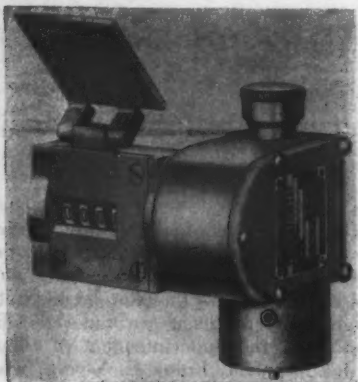
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SEATTLE

ENGINEERED TRACTOR EQUIPMENT

Carey Elastite
EXPANSION JOINT
Standard in Concrete Construction for 31 Years
ECONOMICAL and EFFICIENT
Asphalt Joint
Filter Joint
Sub-Grade Joint
THE PHILIP CAREY MFG. CO.
Dependable Products Since 1873
LOCKLAND, CINCINNATI, OHIO



A Durant Hour Meter, this model being for diesel engines.

Running-Time Meters On Equipment Engines

Meters designed for installation on individual engines to record the actual running hours have been developed by Durant Mfg. Co., 1976 No. Buffum St., Milwaukee 1, Wis. These Hour Meters, a recent addition to its already large line of Productimeter counting and measuring machines, serve as speedometers for stationary engines, and their availability now enables owners and operators to maintain equipment at its highest efficiency with resulting increased years of service. The record is obtained through the conversion of an average crankshaft speed into hours of running time. The Hour Meter actually is a geared revolution counter driven through a series of reduction gears so that the normal speed of an engine operating 60 minutes registers one on the counter.

It is reported that Army Engineers have found Hour Meters vitally important for getting accurate operating-time records on many types of construction equipment used at the front, such as air compressors, road graders and pavers.

Catalog No. 20 has just been issued illustrating both standard Hour Meters and specially designed models, with specifications, quantity prices, information necessary for ordering, and suggested uses on motorized construction equipment and machinery, including air compressors, concrete mixers, pumps, tractors, road rollers, crushers, shovels, etc. Copies of the catalog will be sent by the manufacturer on request.

Preserver for Wood That Touches Ground

Practically all wood, especially timber in contact with moist ground or in areas subjected to dampness, is attacked by wood-destroying molds or fungi. By the gradual reduction of the cellulose structure in timber or wood by these molds, the strength and cross-sectional area are gradually reduced, causing failure under loads or made useless by rotting. This is particularly true of sills on wooden bridges and timber abutments.

To control or eliminate dry rot, fungi and molds in wood, whether the lumber be in an industrial structure or on a bridge, an application of Triple-A copper naphthenate wood preserver, manufactured by Quigley Co., Inc., 527 Fifth Ave., New York 17, N. Y., and applied by brush, spray or dipping, will penetrate and impregnate the wood, thereby sealing it against the destructive influences of these wood-destroying organisms.

This wood preserver is non-poisonous to humans and will not bleed through when light-colored paints are applied over it. This makes it particularly adaptable to fence posts and bridge rails. After an application of the Triple-A wood preserver, it is allowed to dry for 48 hours before applying other paints or coating. When a white paint is applied over the copper primer, two coats are used to seal thoroughly against bleed-through. One coat of darker colors

is said usually to cover satisfactorily.

Complete information regarding the amount required for various treatments and prices may be secured direct from the manufacturer by mentioning this news item.

New Schramm Bulletin On Utility Compressors

A new 8-page well illustrated bulletin on all the Schramm portable and stationary air compressors recommended for public utilities has recently been issued by Schramm, Inc., West Chester, Pa. Although directed at public utility companies, the variety of jobs illustrated, such as driving sheet piling, backfill tamping, breaking frozen ground, removing pavement blocks, rock drilling, and pavement breaking, is within the scope of state and county highway department and contractor activities.

The Schramm models available for such work include the 105 De Luxe for mounting on a 1½-ton truck, or mounted on a two-wheel trailer with tool boxes

and hose reels; the Fordair for truck mounting, or on a two-wheel trailer or skids; and the Model 20 two-wheel trailer type. A variety of mountings and set-

ups for special job conditions is shown.

Copies of this new bulletin may be secured direct from the manufacturer by mentioning this review.

COMPARE HOBART "Simplified" ARC WELDING

Are you still using slow, costly methods of metal fabrication on your construction jobs? If so . . . you better investigate faster, lower cost arc welding if you intend to compete in future building programs. Time is important in construction work and you'll find Hobart Multi-Range Dual Control Arc Welders the greatest time savers ever installed. Compare . . . feature for feature . . . and see how much more you get with a Hobart.

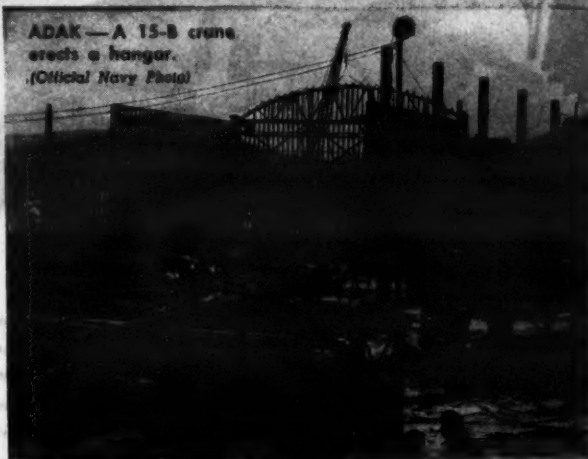


HOBART
BROTHERS COMPANY
BOX CE-104, TROY, OHIO

"One of the World's Largest Builders of Arc Welders."



(Signal Corps Photo)



ADAK - A 15-B crane erects a hangar.
(Official Navy Photo)



ALGIERS - A 10-B dragline widens a drainage ditch.
(Signal Corps Photo)



The men who are doing such an effective job of using today's fine excavators as weapons against the Axis, will be ready to apply their war-developed skill to the operation of tomorrow's better machines. The combination will make excavating a vital factor in building a better peace-time world.

As in war, Bucyrus-Eries, operated by war-trained men, will produce outstanding results on your postwar work.

V-800

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SOUTH MILWAUKEE, WISCONSIN



ALGIERS - A 10-B crane widens a drainage ditch.
(Official Navy Photo)

Airport Development South of the Border

Strides in United States Will Be Matched by Latin American Countries, Where Airways Exceed Highways

By NORRIS M. MUMPER, Director of
Aviation, Office of Inter-American Affairs

SCORES of airports and landing fields have been constructed in the Americas in recent months, despite many wartime obstacles. There is little doubt, moreover, that the airport construction program going on in the United States and the twenty other American republics will be continued as a result of the demands of post-war expansion of commercial aviation.

It is a truism that expansion of aviation and airport facilities proceed together. This has been demonstrated in the rapid development of commercial aviation in the Western Hemisphere since the outbreak of the war. With the expansion of commercial aviation in the post-war period, which some estimates place as high as at least three times the present service, many new airports will be needed.

U. S. Airport Development

There is no way, of course, of knowing exactly how great the post-war development of airports is likely to be, but some idea can be gained by present and post-war trends that are already evident. For example, airport construction trends in the United States not only show the sizable increase in airport facilities that has taken place here since the outbreak of war but also give reason for believing that existing U. S. airport facilities may possibly be doubled in the post-war period.

In the United States, with the completion of more than 550 airport-development projects undertaken by the Civil Aeronautics Administration at a cost of \$400,000,000, there will be, at the close of 1944, more than 3,000 civil airports, of which 940 will be Class III or better, that is, suitable for scheduled air carrier transport.

But because of the anticipated post-war expansion of aviation in the United States, the CAA has recommended that the United States' goal of 4,000 airports, which was originally projected in 1939, now be raised to a post-war goal of 6,000 airports within five to ten years after hostilities cease. This proposed post-war program will cost approximately \$1,000,000,000.

Airports in Latin America

Latin America has similarly undergone rapid airport expansion since the war began. In the twenty other American republics, at the close of 1944, there will probably be more than 2,100 civil airports, of which between 300 to 400 will be Class III or better. Because expansion of airport facilities must go hand in hand with expansion of commercial aviation, the other Americas will obviously experience airport expansion of

record-breaking proportions in the post-war period.

News reports of aviation and airport developments "south of the border" illustrate how present and future airport trends in the United States are duplicated in the other Americas. In Peru, for instance, in order to prepare for post-war aviation expansion, the Peruvian Airport & Commercial Aviation Corp. (CORPAC), a corporation owned entirely by the Peruvian government, was recently formed, with an initial capital of \$1,538,000. The charter gives this new agency wide powers to organize and manage airports. Projected improvements for the airport at Lima will cost \$183,000. In the neighboring Republic of Chile, appropriations of \$646,000 have been made, to be used in part

for the construction of a network of airfields throughout the nation. In Brazil, several large airfields, capable of accommodating large cargo planes, and also a pilot training school are to be built in the State of Rio Grande do Sul, according to a recent report.

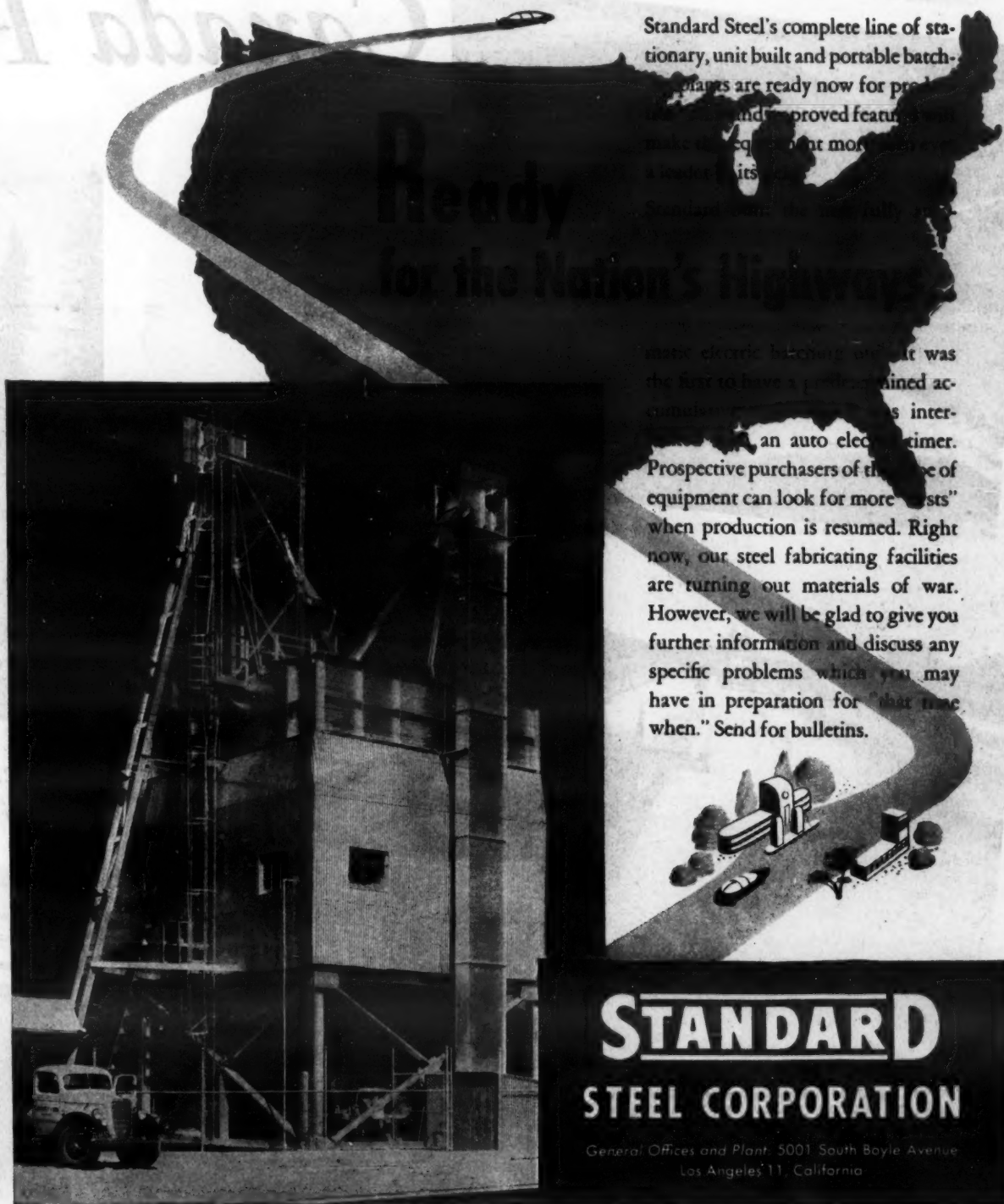
In Nicaragua, airline facilities were increased substantially during 1943 with the completion of the modern Las Mercedes Airport, the second large airport near Managua, and the inauguration of two new airlines, one a common carrier to New Orleans, La., from Balboa, Panama, via Guatemala City and Merida, Mexico, and the other, a charter service, to Miami, Fla., from San Jose, Costa Rica, via Tegucigalpa, capital of Honduras, and San Salvador. In recent years, especially during 1943, airports have been built in the remote jungles of eastern Nicaragua, to provide for the shipment of machinery to the gold mines and the transportation of men, supplies and foodstuffs to the rubber-tapping areas. These airports made possible the necessary quick shipment of highly

perishable Hevea rubber seedlings and budwood of high-yielding clons, cinchona seedlings, Derris cuttings, and other strategic plant stock from isolated areas. Without the aid of airways, establishment of these complementary crops in eastern Nicaragua would have been impossible, the Department of Commerce reports.

In Paraguay, Panair do Brasil's new airfield at Campo Grande, near Asuncion, the capital, was opened in April. In Ecuador, the airport-extension project at Guayaquil has been completed. According to the Ecuadorian Foreign Office bulletin, Ecuador plans to construct near its principal cities a network of airfields that will in the future facilitate national air transportation.

Mexico, which has a splendid modern airport at Monterrey, will have two new ones soon, at Nuevo Laredo, across the border from Laredo, Texas, and at Mexico City. The latter airport, an expansion of the present Aeropuerto Central, will boast five main runways ranging in

(Continued on page 66)



Standard Steel's complete line of stationary, unit built and portable batch plants are ready now for production. They have many improved features and are equipped with more than 100 different models to suit your needs.

Standard Steel's batch plant was the first to have a permanent accumulation of material in its intermediate storage bin, an auto electric timer. Prospective purchasers of this type of equipment can look for more "costs" when production is resumed. Right now, our steel fabricating facilities are turning out materials of war. However, we will be glad to give you further information and discuss any specific problems which you may have in preparation for "that time when." Send for bulletins.

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Builders of Fine
WHEEL BARROWS:
AMERICAN
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Sidney, Ohio
Watch for
Post-War
Models



MUSKEG. Workers on the Alaska Highway and too w...
the recently completed Trans-Canada Highway between...
other view of this muskeg section after an excessive...
all replaces the muskeg...



Canada Plans Road



British
Combine
Photos



Trans-Canada Highway
Typical of Newpro
Open Up Undeveloped
In the ys

TRANS-CANADA. This new route across the Dominion...
smooth riding roadway with some of the most
superb scenery in the world. This stretch is at Bow Lake, Banff National Park,
Alberta Province, with Crowfoot Glacier providing the background.

QUEEN ELIZABETH WAY.

This four-lane concrete express highway connecting Buffalo, Niagara Falls, and other U. S. border points with Toronto, Ontario, exemplifies Canada's realization of the importance of good roads, now and in the future. Top photo, one of the grade separations on the route, the half clover leaf at Martindale, Ontario. Directly above, preparation of the subgrade on a section of this superhighway, and, at right, a close-up of concreting on the route.

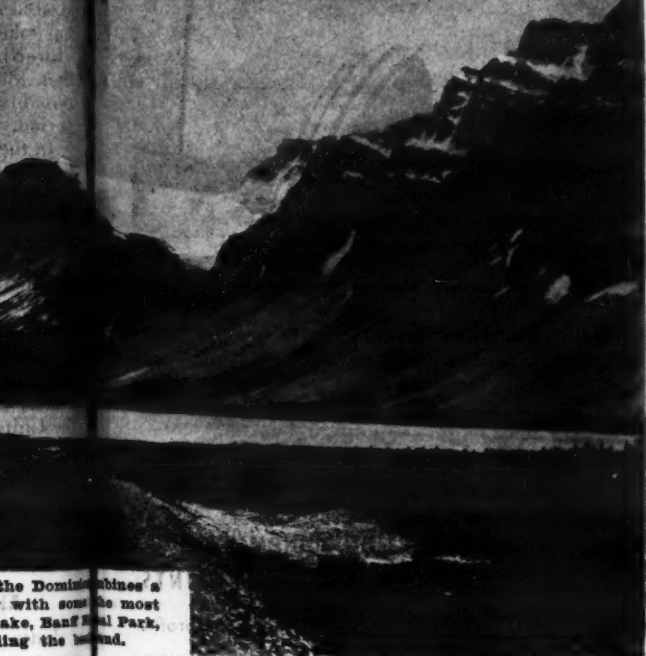


showed too well acquainted with muskeg which bedevils
Left, a muskeg section ready for fill on the last link of
way between Hurst and Geraldton in northern Ontario. Below, an
excessive fill had turned the road cut into a canal. Right, a solid
muskeg on the same section of road.



Roads for the Future

la Hwy and Queen Elizabeth Way
of Newproved Routes Which Will
Undeveloped Areas and Invite Tourists
in the Days of Peace Ahead

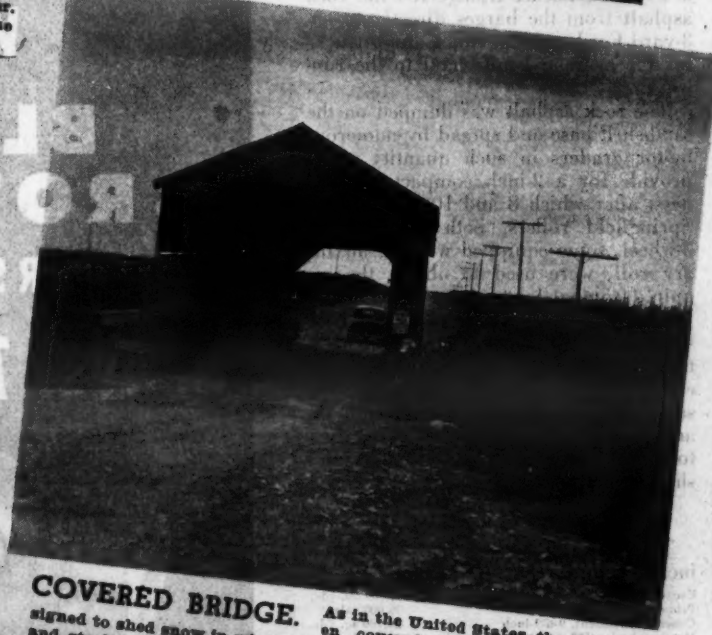


the Dominion
with some
lake, Banff
ing the land.



TOURISTS have found much of
terest in Nova Scotia, and will again when
peacetime pursuits are once more in order.
This curving road is located along the
coast line of Cape Breton, N. S.

DEVELOPMENT. Much of
Canada's
resources will soon be accessible for
development, as a result of her road-
building program. Below is a stretch
of highway in the making near Kirk-
land Lake in northern Ontario, an
area rich in minerals.



COVERED BRIDGE. As in the United States, the old wood-
en covered bridge in Canada, de-
signed to shed snow in winter, is fated to give way to modern concrete
and steel when the post-war highway program gets under way. This
link with other days is on a
road in the French-Canad-
ian province of Quebec.

Rock-Asphalt Paving At Airfield in Texas

(Continued from page 25)

ped by rail to Seadrift, where it was transferred to barges of 30,000-gallon capacity for the 30-mile tow to the Peninsula and pumped directly from the barges to the distributors.

The application of this tack coat to the shell base was accomplished in a rather unusual manner which produced very satisfactory results. The first application was a mixture of 400 gallons of emulsion and 600 gallons of water in a 1,000-gallon gravity fed tank truck. Light blading of the top surface of the shell base followed this application, resulting in a penetration from $\frac{1}{4}$ to $\frac{1}{2}$ inch of the water-emulsion mixture. This $\frac{1}{4}$ to $\frac{1}{2}$ inch of emulsion-impregnated material was bladed into windrows on 10-foot centers, after which an application of 200 gallons of emulsion, mixed with 800 gallons of water, was sprinkled over the entire area. Motor graders and pneumatic rollers then spread and compacted this light top layer of impregnated material. After the surface was true and properly compacted, a third application of a mixture of 200 gallons of emulsion to 800 gallons of water was made. The rate of application was so adjusted as to give a total application of 0.4 gallon of emulsion per square yard.

Using two motor graders and three tank trucks, the contractor was able to make the complete application with satisfactory spreading and compaction on one 4,000-foot runway per day.

Rock-Asphalt Surface

Rock asphalt from Uvalde was shipped by rail to Seadrift, where a Koehring crane equipped with a Blaw-Knox $1\frac{1}{4}$ -cubic-yard clamshell bucket unloaded from cars directly to thirty trucks, which hauled the material 19 miles to stockpiles established at Port O'Connor, where the contractor had dredged a slip for the safe handling of material barges.

From the Port O'Connor stockpiles, another Koehring crane with a 2-yard Williams clamshell bucket transferred the rock asphalt to barges of an average capacity of 400 tons and one 30 x 175-foot hopper-type barge carrying 750 tons, for the 11-mile water haul to the Peninsula.

At this point a Link-Belt crane with a $1\frac{1}{2}$ -yard bucket transferred the rock asphalt from the barges directly to ten 3-yard Ford and Chevrolet dump trucks for the average 1-mile haul to the runways.

The rock asphalt was dumped on the sand-shell base and spread by numerous motor graders in such quantity as to provide for a 2-inch compacted thickness, after which 8 and 10-ton Buffalo-Springfield rollers, both tandem and 3-wheel, some equipped with an auxiliary roll, were used to obtain the required compaction.

Near the point on the Peninsula where shell and rock asphalt were unloaded, the contractor erected a 1,000-gallon elevated steel tank, which was filled with salt water by a 3-inch Barnes pump, and from which the water trucks, used to sprinkle compacted subgrade and shell base, obtained their water.

Major Quantities

The major quantities in the contract included the following:

Excavation	200,000 cu. yds.
Prime coat (emulsion)	76,000 gals.
Concrete pavement, 9-6-9-inch	66,700 sq. yds.
Metal arch pipe (37 x 21-inch, 14-gage)	1,870 lin. ft.
Metal arch pipe (44 x 26-inch, 12-gage)	3,200 lin. ft.
Topsoil application	200 acres
Gravel shell base (6-inch compacted)	211,000 sq. yds.
Rock-asphalt surface, 2-inch	184,000 sq. yds.

Personnel

The contract for this runway construc-

tion at the Matagorda Peninsula Gun- nery and Bombing Range in Texas was awarded by the Galveston Office of the U. S. Engineers to Brown & Root of Houston, Texas, on their bid of \$1,011,404.10. Work was started on January 11, 1944, and completed on May 30. James M. Dellinger, Vice President, was in charge for the contractor and Jesse Thomson was Field Superintendent. For the U. S. Engineers, the work was under the direction of the Galveston District Engineer, with Captain W. J. Lynch as Resident Engineer, assisted by Lloyd Campbell and Thomas N. Cosgrove.

Dealer's Headquarters Visited "Pictorially"

Highway engineers and contractors in eastern New York and Connecticut will be interested in an attractive 36-page brochure just issued by the H. O. Penn Machinery Co., 140th St. and East River, New York City, distributor of construction machinery, which displays photo-

graphically the facilities and activities of the company's sales and service headquarters in New York City, Poughkeepsie, N. Y., Mineola, Long Island, N. Y., and Hartford, Conn. Particularly timely are the photographs of various steps in the reclamation of old and worn machinery by rebuilding, parts-replacement, and the conservation of metal by welding. Other illustrations show shop interiors equipped with overhead cranes

for handling heavy machinery, tool rooms with sliding and stationary tool boards, parts rooms, and close-ups of such precision operations as testing and adjusting diesel-engine parts, all illustrating the service these shops render.

Hamilton O. Penn, President of the company, was responsible for the important wartime job of setting up the national inventory of used construction equipment.

MONDIE DROP and UPSET FORGINGS FOR CONSTRUCTION EQUIPMENT

Such as Dipper Teeth, Trencher Teeth, Gear Blanks, Levers, Tie Rods, Cranks, Crank Shafts, Special Shapes, etc. Forging weight range from 1 to 50 pounds.

Inquiries given prompt attention by our Engineering Dept.

MONDIE FORGE COMPANY INC.

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Flexibility

WITHOUT FATIGUE!



When BLOOD BROTHERS UNIVERSAL JOINTS Deliver The Power!



BLOOD BROTHERS MACHINE COMPANY

IN BUYING CONSTRUCTION EQUIPMENT LOOK FOR BLOOD BROTHERS UNIVERSAL JOINTS

Insure maximum production, greater per-hour profits and lower maintenance and operating costs for your equipment by insisting on Blood Brothers universal joints for power transmission. Blood joints are mechanical masterpieces that have no superior in design, performance or stamina — the result of over 35 years specialization in delivering power through misalignment and angularity.



Free Engineering Data
Complete specifications
on all Blood Joints.
Write Dept. 10. Ask for
Blood Engineering Bulletin.

Allegan, Mich. - Div. Standard Steel Spring Co.



Public Roads Administration Photo

The Goascoran Bridge, forming the Inter-American Highway link between the Republics of El Salvador and Honduras, is a continuous-deck-truss steel structure, with span lengths of 129 feet 6 inches, 222 feet, and 129 feet 6 inches. It was built by Frederick Saare Corp., of New York City, as a part of the highway and bridge construction program now being carried out by the U. S. Public Roads Administration. The piers and abutments are of stone-faced concrete, lightly reinforced. The structure provides a roadway of 24 feet between curbs plus a 2-foot walkway on either side.

A New Tread Design For Synthetic Tires

A tread design, said to be revolutionary, for truck tires of synthetic rubber has been announced by the Goodyear Tire & Rubber Co., Akron, Ohio. It is reported that this design retards the growth of tread cracks and reduces the running temperatures of the tires by as much as 50 degrees. The new design was developed especially to meet the peculiarities of synthetic rubber rather than another attempt to adapt methods used in the tread designs of natural-rubber tires.

Since natural-rubber products were curtailed by war, rubber experts throughout the country have been seeking means for overcoming the tendencies of synthetic rubber to overheat and crack when used in truck tires. The new Hi-Miler S Rib tread retards crack growth by altering the conventional, continuous tread ribs to include terminals at approximately every half inch in the crevice between the ribs. It is in these crevices that damaging breaks or cracks usually originate. Reduction of the heat is accomplished by a completely ventilated shoulder on each tire instead of the conventional unbroken rib-type shoulder.

Production is now under way on this Hi-Miler S Rib truck tire of synthetic rubber in the entire range of sizes for all over-the-road uses. Officials state that it is intended as a companion to Goodyear's All-Weather tire with the conventional diamond tread, which is unchanged.

R. K. Stockwell Dies

Rupert Kennedy Stockwell, long associated with Robins Conveyors Inc., of Passaic, N. J., died at his home in Oakland, Calif., on August 24. Mr. Stockwell, familiarly known as "Stock", joined the Robins organization in 1911, and in 1937 returned to the New York Office after having served in Chile, London and Shanghai. In 1938, he took charge of all Robins sales on the Pacific Coast,

with offices at 116 New Montgomery St., San Francisco.

Mr. Stockwell was a member of the

American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the Engineers Club of San Francisco, and the Royal Automobile Club of London.

Navy Needs Increased Number of Motor Graders

The Navy's requirements for motor graders during 1945 are expected to be approximately 75 per cent above those of 1944, the Motor Grader Manufacturers Industry Advisory Committee was informed by War Production Board officials recently. Army requirements in 1945 will be about the same as those in 1944.

Civilian needs for 1945 will be about two and one-half times greater than the number of motor graders authorized for production in 1944, it was added. However, 1945 civilian requirements have not yet been screened for essentiality. Main civilian users are state and local governments, and the lumber, mining and petroleum industries.

Cali Firm to Introduce Kotal in Colombia, S. A.

Vicente y Federico Uribe R., of Cali, Colombia, well-known civil engineering firm in that country, will soon introduce the Kotal process in Latin America, having recently been appointed distributor for the Kotal Co. of New York City in the entire republic of Colombia.

Vicente Uribe R. obtained his engineering education in both Colombia and the United States and has contributed articles for publication in leading construction magazines. As Chief Engineer of the Calpuerto Airport, Mr. Uribe is in charge of this \$1,000,000 airport being built by Pan American Grace Airways, Inc. Federico Uribe R., the other brother in the firm, has been engaged in heavy construction for some years.

Under the tropical weather conditions existing in Colombia, it is believed that the Kotal process will eliminate one of the serious causes of delays in the construction of highways and airports in that area.



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THE 3/4-SWING BADGER
MOVES MORE MATERIAL...
FASTER AND CHEAPER



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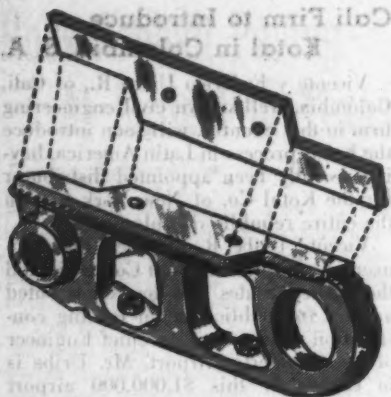
Hayward makes all four—clamshell, dragline, electric motor, orange peel. A Hayward recommendation is unprejudiced.



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Hayward Buckets





Worn track link castings may be built up with special steel plates developed by Allied Steel Products.

New Repair Method For Tractor Links

The tractor link or rail on crawler tractors receives a great amount of wear, due to abrasive materials from the soil falling into the working parts of the track. To maintain maximum traction efficiency, frequent replacement of these moving parts becomes necessary as they become worn. This repair makes it necessary to lay up the tractor, dismantle the entire assembly, and replace pins, bushings, nuts and bolts with new castings and parts.

Through the development of special steels for welding, repair and replacement costs and "lay-up time" are greatly reduced. The link castings can now be salvaged by welding on to the rail surface a special steel plate, developed by the Allied Steel Products, Inc., N.B.C. Bldg., Cleveland 14, Ohio, which builds up the worn surface, restoring the worn casting to its original weight and thickness. These plates are fabricated to correct sizes to fit the track link casting and are affixed by gas or electric welding. They are made of a special work-hardening steel which becomes tougher with use. The manufacturer states that approximately 200 pounds of these special plates will save the purchase of a ton of castings.

Complete information on these new repair parts for all makes and models of tractors may be secured directly from the manufacturer.

Mexico City Builds New Water Service

Mexico City, plagued by a long-standing water-supply problem, is now taking steps to double the amount of water available to its residents and at the same time provide surrounding areas with new irrigation and hydro-electric power resources. A 17-mile aqueduct now under construction will carry water from the Lerma River basin, west of Mexico City, to homes and factories in the metropolis before being diverted to irrigation projects in the states of Mexico and Hidalgo, east of the capital.

On its way to the city, the water will help fill one of Mexico's most urgent needs and make a substantial contribution to agricultural and industrial expansion in the capital area by generating approximately 15,000 hp of electrical energy divided among plants at San Bartolito, Rio Borracho, and Tecamachalco.

Work on the project, begun in 1942 and costing approximately \$1,960,000 to date, has so far been limited chiefly to excavating for the 17-mile aqueduct and construction of certain sections. The aqueduct will be about 11 feet in diameter and of a special brick construction.

The most difficult part of the project will lie in boring a 9-mile tunnel, with a capacity of 353 cfs, through the Sierra de las Cruces, separating the Valley of Toluca from the Valley of Mexico. The topography of the region requires eight smaller tunnels with a total length of

approximately 1 1/2 miles and a varied system of tubes, bridges and syphons. Plans for the aqueduct were drawn up several years ago, but funds for its construction did not become available until two years ago.

Use of Calcium Chloride To Prevent Frost Heaving

The use of calcium chloride in various types of soils and soil-aggregates as an effective and economical means of preventing frost heaving on roads and airport runways is discussed in an Information Sheet made available by the Calcium Chloride Association. This discussion includes the results of tests made under varying temperature conditions and gives definite figures on the amounts of the chloride to be used in specific kinds of soils; directions as to the depth to which the treatment should extend, depending on climatic conditions, the density of the soil and other factors; as well as methods of application. The source material used in conjunction with

the tests in preparing these data is also listed.

Copies of Information Sheet, Brief No. F-61, may be secured by writing di-

rect to the Calcium Chloride Association, 4145 Penobscot Bldg., Detroit 16, Mich., and mentioning CONTRACTORS AND ENGINEERS MONTHLY.

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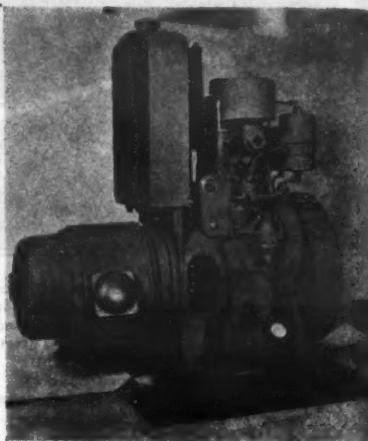
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• To provide faster, more economical timber transportation, Weyerhaeuser Timber Co. is building its own roads and super-truck highways.

To turn out the required aggregate *fast and economically* they're using two TelSmith Portable Crushing Plants—one at Longview, Wash.—the other at their Molalla, Oregon operation pictured here.

Each is a TelSmith Two-Unit Portable Crushing-Screening Plant with an 18" x 32" Primary Jaw Crusher with feeder, a 28" Intercone Secondary Crusher, conveyors, vibrating screen, power units, and steel bin.

These logging roads are being built to highway specifications. When producing a minus 4" plus 1" aggregate for base course and a minus 1" for top course, with the Primary Jaw Crusher set at 3", and 100 per cent of the material being crushed, these

TelSmith Portable Plants average 75 cu. yds. per hr. When producing a straight minus 1" aggregate for top course, they average 40 to 50 cu. yds. per hr. The rock is very hard and tough, but plant capacity has more than met expectations.

For private logging roads—or any highway anywhere—TelSmith Portable Crushing-Screening Plants will produce the aggregate more economically. Get Bulletin P-34.

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Asphalt Resurfacing On Illinois Highways

Specifications and Methods Used to Rehabilitate Old Pavements with New Surfaces Of Bituminous Concrete

By WESLEY W. POLK, Chief Highway
Engineer, Illinois Division of Highways

AT the present time, Illinois bituminous construction operations are confined principally to the resurfacing of some of the older pavements. A large percentage of the state highway system was constructed in the early 1920's; however, some of the older pavements in the system were constructed between 1915 and 1920. These pavements have given excellent service, but some of them were in need of repair before the war started. Many miles of this old pavement have been rehabilitated by resurfacing with bituminous concrete.

Illinois first started resurfacing old pavements in 1933, when 15 miles of sheet asphalt and bituminous concrete were used to resurface certain locations on the state highway system, principally on old street surfaces within the limits of municipalities. The following year about the same amount of resurfacing was done.

In 1935, three types of bituminous resurfacing were placed on 3.6 miles of U. S. 30, between Joliet and Chicago Heights, in Will County. The traffic on this road is rather heavy, including a considerable number of trucks, so these sections have been considered more or less as an experimental project. They have given satisfactory service for the past eight years. However, one section has been outstanding in performance and it is similar, in some respects, to the present resurfacing.

During the next few years, Illinois resurfaced very few miles of pavement, but observations were continued. In 1942, some of the Illinois Division of Highways engineers made an inspection of bituminous resurfacing in neighboring states in order to gather information on this subject.

Resurfacing Specifications

Illinois finally decided upon a plant-mix bituminous concrete for the resurfacing of old pavements, using two-course construction because it is believed that better riding qualities can be obtained with this design. The thickness of the resurfacing may be 2½ or 3 inches, depending upon the nature and density of traffic and the condition of the old pavement. The lower or binder course is 1½ inches thick, and the surface course is either 1 or 1½ inches thick, depending on the total thickness desired.

The specifications permit two sizes of binder-course mixture. Gradation A provides for 95 to 100 per cent of coarse aggregate passing a 1-inch sieve, and Gradation B provides for 95 to 100 per cent of coarse aggregate passing a ¾-inch sieve. The average binder mixture contains 65 per cent coarse aggregate,

30 per cent fine aggregate, and 5 per cent bitumen.

The bituminous-concrete surface course is designed so that the pavement will contain surface voids, giving a rather open appearance. This is accomplished by reducing the fine-aggregate content in the mixture to a point where the voids are completely filled without leaving a surplus of fine material, as the latter condition would cause a smooth finish on the surface of the pavement, defeating the purpose of the design. Specifications require 95 to 100 per cent of the coarse aggregate in the surface-course mixture to pass a ½-inch sieve. A typical gradation of surface-course mixture contains 56 per cent coarse aggregate, 32 per cent fine aggregate, 6 per cent mineral filler, and 6 per cent bi-

tumen. These are approximate percentages and the gradation and characteristics of the aggregates determine the exact amount.

The mixtures are prepared in an asphalt plant meeting rather rigid requirements to insure the accurate control of temperatures, aggregates, and asphalt specified for the mix. When the plant is in operation, samples of the mixture are sent to the laboratory at Springfield each day for analysis. Several years' experience has indicated that it is possible to control the bituminous mixtures specified, and the materials usually come well within the tolerance limits.

Prime-Coat Experience

In 1942 a considerable amount of resurfacing was placed under traffic without a prime coat, as it was thought that it would be entirely too difficult to prime the pavement under traffic. Some construction difficulties were experienced that year, as the binder course and sometimes the surface course would displace under the roller, frequently forcing the

material beyond the edge of the pavement onto the shoulders. The material also built up over the transverse cracks in the pavement, causing ridges in the binder. These ridges were often noticeable in the surface course.

It became necessary to prime one of the pavements in 1942 before the resurfacing could be finished. Much to our surprise, the contractor was able to place a prime coat in a checkerboard application, filling in the unprimed areas the following day without any particular inconvenience to traffic. As a result, a prime coat is used for all resurfacing.

Resurfacing Operations

Before the old pavements are resurfaced, they are repaired by replacing the isolated pieces of pavement that are moving under the impact of traffic. The amount of concrete patching necessary on the average resurfacing contract is very small; in fact, some of the pavements do not require any.

Pavement repair, pavement widening
(Concluded on page 79)

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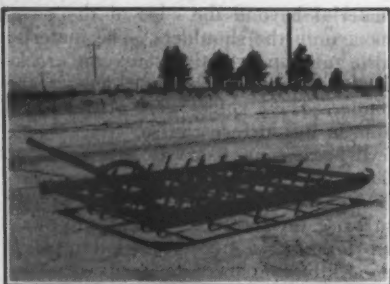
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A harrow, heavier than a farm harrow and durable enough to withstand rough usage, developed by the North Carolina State Highway and Public Works Commission for use on roadside areas.

Special Equipment Speeds Seeding Jobs

(Continued from page 29)

grass and rye is that after they have served the purpose of rapid and temporary checking of erosion they can be cut after maturity and used as mulch.

Mechanization of Seeding

Although the day of hand raking and rolling on highway seeding jobs has long since passed, it has been only during the past year that mechanization of seeding on new construction in North Carolina has become fully developed. It might be described as "farming" the roadsides with combinations of farm equipment and highway equipment wherever slopes are 3 to 1 or flatter.

This mechanization of erosion-control work has been brought about rapidly by several factors. Wider shoulders, generally wider cross sections as a whole, and flatter slopes provide areas on which machinery can be used; and the very size of the areas requires some speedy means of seeding. Shortage of labor is an important factor, for the use of "farming" methods requires only about one-half as large a crew as for only partly mechanized operations.

In this roadside "farming", the power is usually supplied by farm-type tractors, although for seedbed preparation in very heavy and very sandy soils small crawler-type tractors are needed, and for light finishing work on shoulders ordinary motor trucks can be used to pull light equipment.

In most cases, extensive seedbed preparation is not necessary on new construction projects, but where it is required, motor graders with scarifier attachments are preferred on shoulders because of the easy regulation of depth of scarifying and the ability, in the same operation, to keep the shoulder in proper shape by light blading. Tractor-drawn disk harrows or scarifiers are used on slope areas where motor graders cannot be used.

Following this initial loosening of the seedbed, a farm-type soil pulverizer or Cultipacker is used to break up clods and firm the soil, after which a peg-tooth harrow is used for additional pul-

verizing and smoothing. In the sandier soils, of course, the Cultipacker operation is unnecessary.

Since most North Carolina soils are acid, agricultural limestone is generally required, and this is applied by a lime distributor prior to the harrowing, so that it becomes thoroughly mixed with the soil.

Seed and fertilizer are then applied by a combination seed and fertilizer drill, sometimes followed by a three-piece 2 x 8-inch board drag. This type of drag is particularly valuable in finishing shoulder areas. Rolling the seeded areas is seldom necessary in sandy soils, but a 6-foot-wide water-ballast roller is used in the final operation on the heavier soils, with the weight adjusted to soil conditions.

Special Harrow Developed

It was found some time ago that the standard farm peg-tooth smoothing harrow was neither heavy enough for roadside seedbed preparation nor sturdy enough for the rough and continuous

operation to which it was subjected. After some experimentation, a heavier but still easily manageable all-steel harrow was built in the Highway Shops and, after six months of use, it seems to be the answer to the harrow problem.

It is constructed in three sections which can be used singly, in line, or tandem, according to the width of the seeding area or type of soils. Each section is 4 feet wide x 5½ feet long, with 26 teeth in five rows and adjustable in pitch. The teeth are of the type of steel used in scarifier teeth, reversible, and fastened to the tubular cross members by U-bolts.

This harrow is heavy enough to be used for loosening the surface of 1½ to 1 fill slopes prior to seeding. It is suspended by a chain from a boom-like pole attached to a truck or tractor on the pavement or shoulder. The chain is lengthened or shortened so that in successive trips the entire slope area is harrowed, and ropes from the harrow to men at the bottom of the slope keep it running uniform.

Work on Steep Slopes

On cut slopes steeper than 3 to 1, farm machinery cannot be used. In these cases, where erosion conditions are particularly severe, the slopes are prepared, seeded and mulched by hand; but under present conditions, these slopes generally are not included in the seeding schedule after new construction, but are subsequently mulched by maintenance forces, using right-of-way cuttings, and perhaps still later are seeded through the mulch.

Maintenance Seeding

In addition to the seeding immediately following new construction, as just described, the maintenance forces in North Carolina do considerable seeding, mostly on shoulders, as the final step in shoulder repair. Equipment used on this work varies considerably from one maintenance district to another, but generally all operations except the actual application of the seed and fertilizer are done by machinery.

(Concluded on next page)

...how to spread highway materials



The Buckeye Spreader is the ideal machine for spreading sand, gravel, or crushed stone—from a fine trickle of sand to a 1½" layer of rock. It spreads the material with almost absolute uniformity, wasting no material through scattering and leaving no thin spots to cause trouble later. The spread can be tapered, thick on one edge and thin on the other. Width of strips is easily controlled to fit your needs.

With a Buckeye Spreader, there's no need for raking and brooming, no patching, no cleaning up edges, no filling in low spots. Many users report savings up to 50% in time and labor, and 20% on materials—and in addition—they get a better job.

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Hand and Motor driven spray.
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ELKHART

INDIANA

North Carolina Plans Roadside of Future

(Continued from preceding page)

During 1943, the total amount of seeding of this type done by maintenance forces was approximately double the seeding areas on new construction.

Post-War Plans

In the office, North Carolina roadside-development activities in 1944 are concerned primarily with post-war plans, not for separate roadside-development projects, but in connection with the regular highway-construction projects. The landscape department personnel is collaborating with right-of-way engineers in considering the acquisition of right-of-way for special roadside areas, such as scenic turn-outs, roadside parks, and roadside picnic-table locations, at the same time that the regular highway right-of-way is obtained.

Work with the design department includes plans and provisions for saving and protecting specimen trees; salvaging of topsoil; and planning, as a part of the initial grading, the "foundation" work on roadside parks and turn-out areas, although most of the final development of such areas will probably be done by state forces rather than by contract. Much of this collaboration with design work is accomplished by the presence of landscape department personnel on the field inspection of project plans before the plans are put into final form.

A major activity at present is the re-



Two sections of a harrow, developed in North Carolina, preparing seedbed on a slope too soft to permit operation of the tractor on the slope. The length of chain is adjustable for successive trips to provide coverage.

vision of the specifications for roadside-development items, along with the revision of the general specifications. Topsoiling, sodding, and tree protection have been handled during initial construction in the past, and it is likely that some of the seeding and mulching of post-war construction will be added as contract items instead of being handled by state forces.

By careful experimental work, we hope to improve still further the techniques of roadside erosion control and have them ready for full-scale use later when highway construction increases.

By planning ahead, we are trying to be ready after the war for a complete program of roadside development integrated with initial construction and with regular maintenance, to help bring about "complete highways" of safety, beauty, utility, and economy.

In the meantime, our principal road-

side activity in North Carolina will continue to be erosion control. This need not be said regretfully, however, because roadsides on which there is no erosion are at the same time safer and more attractive.

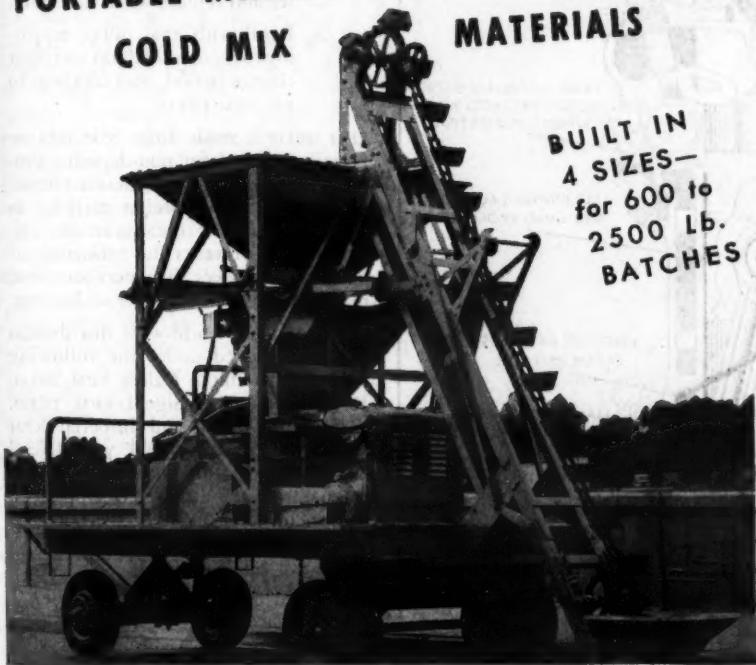
Worn Engine Valves Salvaged by Rebuilding

"Rebuilding Worn Valves by Hard-facing" is the title of a new illustrated 12-page booklet, published by Air Reduction Sales Co., which explains in detail how to reclaim internal-combustion engine valves according to the degree of wear which they have had.

The book groups worn valves into three classes: those not badly burned or guttered; those which have the faces too badly guttered, pounded or burned to permit reclamation by grinding; and those which have deeply burned areas, gutters and cracks. Most of the text of the book deals with reclamation of the latter two groups, which ordinarily would be replaced, by building up the worn faces and other areas with special hard-facing material applied by means of the oxy-acetylene torch.

Copies of this booklet may be obtained from Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y. Just mention this item.

A COMPLETELY SELF-CONTAINED PORTABLE MIXING UNIT FOR HANDLING COLD MIX MATERIALS



BUILT IN 4 SIZES—
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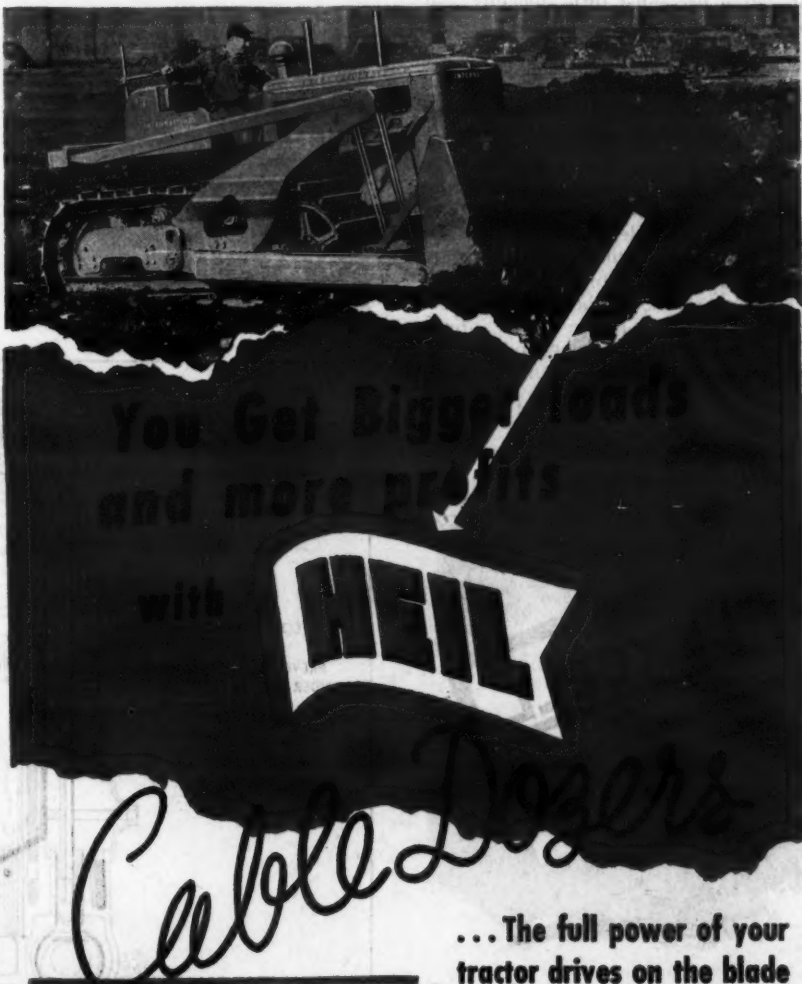
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Automatic Metering System—
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all types of plants.

For handling cut back, emulsion or similar cold mix materials, this H & B Model "M" portable mixing plant requires no additional equipment except a storage tank for the bituminous materials. The plant is furnished complete with folding elevator, weighing equipment, pug mill mixer, pump and power unit. Separate batch weighing of aggregate and asphalt insures accurate and uniform mixtures. All controls conveniently located for one-man operation. Bulletin M-44 will be sent on request. Also built in semi-portable type, without wheels (Model C). Bulletin C-44.

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This big 15-yard tractor scoop is push loaded in 40 to 50 seconds — and hauls at travel speeds up to 20 miles per hour. The tilting floor gives positive mechanical push-out from the bowl and spreads load evenly. It's one of Heil's "bigger yardage at less cost" units that you will need in your post-war business. Write for bulletins.

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Here is a rugged unit that is easily adjusted for an extra deep bite — whether in soft dirt or hard-packed clay — to give you a heaping load. And it's just as easy to adjust this unit for side-casting to right or left — to peel a bank — to grade or ditch — or to push straight ahead. Heil Cable Dozers have the quality features that experienced operators demand: Full vision ahead — fast, positive cable control with little effort — smooth action that is easy on the tractor — and less time out for adjustments and repairs. These famous Heil features add up to "big loads" at less cost — and more profit for you.

Write for bulletins.

R-37

Concrete Operations To Repair Causeway

(Continued from page 13)

stringer forms without difficulty.

The work was so arranged that forty stringers were poured each day and the 160 sets of forms moved and reset daily. Curing was by cotton mats wet with water piped from the city of Port Lavaca to the job site.

Handled from yard to trucks and from trucks to barges by the same Koehring cranes used for the shore handling of piling and timber, the precast stringers were barged to their final location and set by the large derrick barge used for so many operations on this job at the rate of eight or nine spans, with ten stringers per span, each working day. Four of the ten stringers in each span had to be inserted under the tie-down loops of $\frac{1}{2}$ -inch rods projecting from the concrete caps, but this operation presented little difficulty and occasioned no delay.

Concrete Decks

The 1 x 1-inch notches left in the upper corners of the precast stringers provided support for the 1-inch gum boards set in place for deck forms. A gasoline-driven table saw set on the derrick barge cut the gum boards, purchased in random lengths and widths, to a snug fit between the stringers. No attempt was made to remove them after the concrete deck had been poured.

The floating concrete plant, previously used for the pile-bent caps, poured the 5-inch concrete deck on the concrete



Construction and visiting personnel at Lavaca Bay Bridge: left to right, W. A. King, Senior Resident Engineer; W. L. Turner, of Moore & Turner, contractor for the project; James P. Ezum, Texas State Bridge Engineer; and Frank B. Sarles, Western Field Editor of *CONTRACTORS AND ENGINEERS MONTHLY*.

stringers, each 17-foot section of which contained 1,450 pounds of $\frac{1}{2}$ -inch steel rods placed by four men immediately behind, and in conjunction with, the placing of deck forms.

This floating plant consisted of a barge 24 x 71 feet in size, with storage for 350 sacks of cement and 4,300 gallons of fresh water, a wood tower 5 feet square and 50 feet high, a Koehring

14-S mixer with built-in pump for transferring water from storage to measuring tank, and a 2-drum O & S gasoline-powered hoist which handled a $\frac{1}{2}$ -cubic-yard Lakewood tilting concrete bucket raised in the tower and discharging through a $\frac{1}{2}$ -cubic-yard hopper and 20-foot-long metal chute. A Fairbanks wheelbarrow scale, on which all aggregates were weighed, was also carried on this barge.

Two barges 18 x 60 feet in size, with a 110-hp General-Motors-gasoline-engine-powered towboat, transported sand and gravel to the floating concrete plant, one being loaded and moved while the other was furnishing aggregates for concrete. The empty barge was anchored broadside to the completed first spans of the bridge under two 10-foot-wide chutes. Dump trucks bringing sand and gravel from the Victoria plant of Heldenfels Brothers dumped their loads onto these chutes from which the materials slid by gravity onto the transfer barge.

When concreting was in progress, (Concluded on next page)

TYPICAL DIESEL LUBRICATION PROBLEMS:

4. Removal of Deposits from Engines

RPM DELO will clean your engine of sludge and other deposits, even in the ring-belt, unless accumulations of carbon, gum, varnish, etc., have cemented rings so tightly that oil cannot get behind them. The following procedure is recommended for purging conventional engine systems:

1. Drain present oil from crankcase while hot.

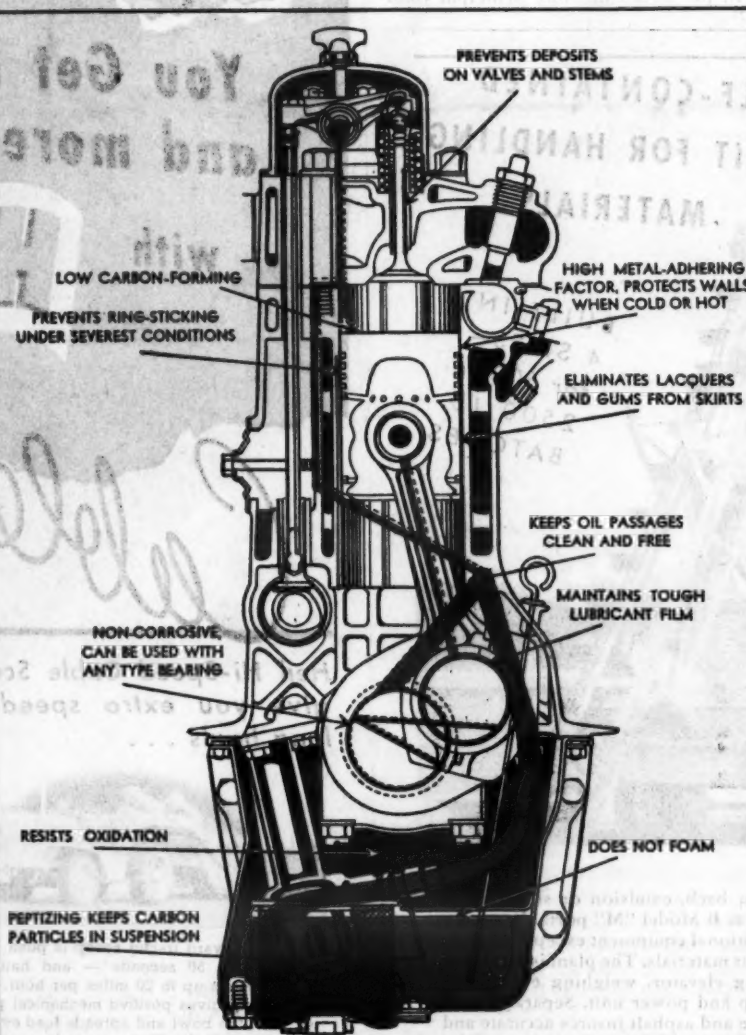
2. Renew filter element to trap abrasive particles that may be carried in circulation during purging.
3. Fill crankcase with RPM DELO.
4. Run engine at fast idle for two hours, maintaining water jacket temperature of approximately 200° F. minimum.
5. Drain again while hot and refill with RPM DELO.
6. Place engine in regular service and drain at one-half normal drain period or 750 miles, whichever comes first, for two or three drains. Check oil frequently as removal of deposits may temporarily increase oil consumption.
7. Drain while hot. Check oil filter and replace when necessary.
8. Refill with RPM DELO, returning to regular oil drain and filter change period, and continue to use RPM DELO.

RPM DELO is made from base oils especially selected for non-deposit-forming characteristics, and contains a detergent which keeps foreign particles in suspension. It also contains an anti-oxidant which prevents the formation of gums and lacquers. It is non-corrosive, may be used with any type of bearing.

RPM DELO has world-wide distribution and is marketed under the following names: RPM DELO, Caltex RPM DELO, Kysco RPM DELO, Signal RPM DELO, Sohio RPM DELO, and Imperial RPM DELO (Concentrate). Ask your Diesel engine manufacturer or distributor for the name of the RPM DELO supplier in your vicinity.



The typical cleanliness of engine parts when RPM DELO is used is illustrated by this oil filter removed from an engine used in heavy duty Diesel bus service for 50,000 miles. Oil pump screen and valve chamber were comparably clean.



This diagram of a typical Diesel engine shows how RPM DELO keeps rings free and maintains clean operation.

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World's Largest Manufacturer of

BITUMINOUS FIBRE EXPANSION JOINT MATERIAL

Lavaca Bay Bridge Restored to Service

(Continued from preceding page)

eight men wheeled, weighed and dumped the sand, gravel, and cement from the supply into the concrete mixer. The mixer operator discharged the mixed batch directly into the tilting bucket which was raised by the hoist operator and dumped into the hopper set high enough on the tower so that the concrete could flow by gravity through the chute to its point of use. One man on the chute and four men with shovels and a Mall vibrator placed the concrete and struck it off with a longitudinal float spanning between bulkheads set over each bent.

Raising Portions of Deck

Another item in this contract was the raising 2 to 25 inches of 190 feet of the old bridge not seriously damaged by the hurricane. In this operation cable loops were placed around each end of the old 12 x 12-inch timber caps which, in that section of the bridge, rested on six piles. Using the large derrick barge, the cap, with one end of both of the two adjacent spans, was raised and held suspended until a foreman and three men placed blocks on three of the six piles to hold it in the raised position.

The other three piles were then fitted with a pile extension of the required length, having two 4 x 8-inch splice plates 68 inches long, held in place by six 3/4-inch bolts, and two 3 x 8-inch splice plates 48 inches long secured by four 3/4-inch bolts. The heavier splice plates extended alongside the cap and were fastened to it by two 3/4-inch bolts. The temporary blocks were then removed and the remaining three piles spliced in a similar manner.

Railing

Placing of the wooden hand railing on the 6,330 feet of the bridge which was rebuilt under this contract, as well as new railing on the 3,440 feet of less seriously damaged bridge which had been rehabilitated by state forces, constituted an important part of the work.

Guard-rail posts were bolted to the outside stringers, three to each span, and two 3 x 10 rails bolted to the posts. Men with air drills, working from a barge, drilled holes and attached the posts to the outside stringers, using the pre-formed holes in the precast concrete stringers where that type of construction was encountered.

After the posts were set, another crew clamped the wood rails, which had been given a single coat of white paint at the material yard, to the posts, and, using the same air tools, drilled the bolt holes through rails and posts. The rails were then unclamped, a second coat of paint was given to the portions which were to be in contact with the posts, and the bolt holes were treated with a solution of Wolman salts heated in a bucket by a fire built in the wheelbarrow used to roll the bucket of hot solution along the bridge floor. They were then firmly bolted to the posts and a second coat of white paint was applied by spray guns.

Major Quantities

Major bid quantities under this contract included the following:

Class A concrete (Slabs on timber stringers)	1,386.78 cu. yds.
Class A concrete (Slabs and stringers)	1,940 cu. yds.
Class A concrete (Caps)	561.20 cu. yds.
Reinforcing steel	975,700 lbs.
Treated-timber piling, 32-foot	31,584 lin. ft.
Treated-timber piling, 60-foot	2,820 lin. ft.
Untreated-timber piling, 35 to 50-foot	65,170 lin. ft.
Treated timber	99 MFBM
Treated-timber pole bracing	15,844 lin. ft.
Treated-timber 3 x 10 bracing	15,844 lin. ft.
Pulling and salvaging timber piling	38,656 lin. ft.
Salvaging lumber	10 MFBM
Driving salvaged timber piling	16,364 lin. ft.
Placing salvaged timber caps	462.13 MFBM
Timber-piling pedestals	120
Timber-piling splices	1,321
Raising timber spans	—
Pile top extensions	115
Observation stations	10

Personnel

The contract for the reconstruction of the Lavaca Bay Bridge was awarded by the Texas Highway Department in June, 1943, to Moore & Turner, San Antonio, Texas. Work was started in July, with 200 working days allowed for completion. Unusual conditions of rainfall and heavy winds seriously reduced the ratio of working days to calendar days and the job was not completed until August, 1944.

W. L. Turner of the firm of Moore & Turner acted as his own superintendent. For the Texas Highway Department, of which D. C. Greer is State Highway Engineer and James P. Exum, State Bridge Engineer, the work was under the direction of M. C. Welborn, District Engineer of District 13, with headquarters at Yoakum. W. A. King, Senior Resident Engineer with headquarters at Victoria, Texas, was in direct charge of construction at the bridge site.

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USE

SOLVAY CALCIUM CHLORIDE

At temperatures below 50°F the development of strength in concrete is seriously slowed up—which in turn holds up finishing and increases operating costs. The addition of Solvay Calcium Chloride to concrete mix offsets the dangerous effect of low temperatures by accelerating set and increasing early strength. This means shorter protection period . . . quicker finishing and release of forms . . . and concrete that is denser, stronger, more waterproof.

Write for free booklet "Calcium Chloride and Portland Cement." Address Dept. 94-10.

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Resurfacing



Asphalt resurfacing of our highways, streets and roads, now greatly in need of attention, offers many advantages. Dangerously cracked and broken pavement is restored to a safe surface. Practically no engineering time is required. Operations can be started immediately and completed within a short time.

Savings are effected through utilizing the old base, eliminating the cost of new construction. Leveling arms smooth out uneven base surfaces.

Using the Barber-Greene Tamping-Leveling Finisher, only a minimum operating crew is required.

There is little traffic interruption as the Barber-Greene lays one ten to twelve foot lane at a time. Because of the tamping action, material is compacted immediately behind the machine so that rolling can progress right up to the Finisher.

For further information on the B-G Finisher and its availability now, write Barber-Greene Co., Aurora, Illinois, U. S. A.

BARBER-GREENE

AURORA ILL.

Some Ways to Salvage Wire Rope and Cable

The Secondary Uses of Worn Cable Reduce Orders for New Wire Rope: Lubrication Extends Its Life

♦ DON'T discard your worn wire rope. The overall wire-rope requirements in the construction industry may be reduced as much as 25 per cent through the judicious use of worn rope. Although there are many rope applications which demand strong, safe, secure rope, there also are many tasks which can be performed by used sections of cable.

Many users of wire rope throw perfectly good sections of cable into the steel scrap heap simply because it is worn and appears to be unfit for further work at its old job. They believe that by turning the wire rope in for scrap, they are making the best contribution to steel conservation. In fact, if it is possible to make use of that worn section of cable somewhere else, steel conservation is hindered when the rope is turned in for scrap because it means that new wire rope is being used where new rope is not required.

It is easy to stretch your wire rope. Many hours of productive life may be salvaged from rope that no longer can be used for haulage rope or with industrial hoists where safety factors of four to six are necessary. It is perfectly safe to use sections of worn rope for trip cables on shovels or taglines on bucket cranes. In these uses, if rope breakage occurs, it does not create a job hazard.

Selecting the Job for Old Cable

Common sense must be exercised in finding a job for worn cable. Heavy loads or stress should not be placed upon the worn rope. Some of the same points that are considered in selecting a new wire rope should be observed in finding a use for worn wire rope. Only a minimum safety factor is necessary when a rope is static. Usually worn wire rope may safely be used as guy lines, pull ropes or guard lines.

The load which the worn rope is to support must be negligible, as should be the load shock and rise in working temperature. The size of the rope, too, must be considered. When discarded cable is used as drag cable on draglines or as a trip cable, it should be of the correct diameter to fit the sheaves and preferably should be the preformed type since flexibility is desirable in all ropes subjected to bending and turning.

The number of jobs in which a discarded section of wire rope may be used depends to a large extent on the condition of the core of the rope. When the core of wire rope dries out and collapses or when internal corrosion has weakened the rope, it is obvious that the cable cannot be used for lifting or carrying loads. If, however, the rope is properly maintained, it not only will last longer on the toughest job, but will be more serviceable and adaptable in its secondary employment.

Lubrication Promotes Service

Selection of the proper rope for the job, correct spooling, and good operation are all important in the maintenance of cable, but perhaps the most important single factor in determining the service which a rope will give is lubrication. If a rope is properly lubricated, it will last a great deal longer, regardless of where or how it is used.

Preformed wire ropes are provided with an inner-core lubrication at the time of their manufacture. The lubrication must, however, be renewed at regular intervals to prevent internal corrosion since continuous service squeezes out the original lubrication. Wear, weather, rust and corrosion are the ene-

mies of wire rope. Lubrication safeguards the rope and permits the internal wires which move against each other when the rope passes over a sheave or winds on a drum to slide freely and with a minimum of friction. When there is undue friction, the inner wire breaks and the rope is weakened.

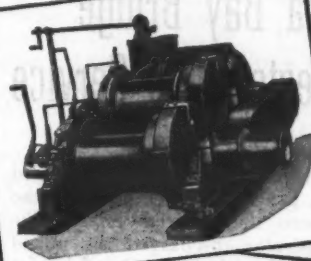
There are several methods of lubricating wire rope. One commonly used method is to clean the wire rope thoroughly with kerosene and a wire brush, and then to apply light-bodied lubricant with a fairly stiff brush, or a paint brush. Another simple method of renewing the inner lubrication of a section of preformed wire rope is to hold a swab around the rope and behind the sheave, pouring on a hot, penetrating oil as the rope is run through the sheave.

Heated lubricants are better than cold lubricants and are especially effective when applied by the bath method. A simple bath method is to pass and repass the rope through a trough filled with hot oil until the lubricant has penetrated to

(Concluded on page 80)

Hoists to Fit the Job

Lidgerwood hoists have earned a 70-year reputation for dependability and efficiency on the job. There's a Lidgerwood gasoline, steam, electric or Diesel hoist to fit every construction need. When you need a hoist inquire first of LIDGERWOOD.



HOISTS FOR: CABLEWAYS INDUSTRIAL PLANTS CONTRACTORS MINES-DOCKS RAILWAYS

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Manufacturing Company

Independent Boom Control

POSITIVE CONTROL FOR ACCURATE SPOTTING

...saves seconds on material handling work. Independent boom control permits accurate handling of bucket for unloading cars, stock piling, charging materials bins. Raising or lowering the boom while in short travel work. Every move is a production move. Plan your post-war jobs with Koehring equipment. Koehring is planning to give you modern, high production, cost-cutting equipment. Wait for a Koehring!

KOEHRING COMPANY
Milwaukee 10, Wisconsin

HEAVY-DUTY CONSTRUCTION EQUIPMENT



Official After in the ing Co dosers island

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Expe lizer in the Bur the Co ment o Cross H and Wi of the s is to do omy of

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Official U. S. Navy Photo

After the battle of Namur on Kwajalein in the Marshalls, Navy Seabees operating Caterpillar diesel tractors and bulldozers begin the task of converting the island into an advance base for our armed forces.

A Liquid Fertilizer Used on Road Slopes

Experimental applications of fertilizer in liquid form have been made by the Bureau of Roadside Development of the Connecticut State Highway Department on cut slopes along the Wilbur Cross Highway in the Towns of Tolland and Willington in the northeastern part of the state. The purpose of these trials is to determine the efficiency and economy of this method of application.

The sites chosen for these experiments are fairly uniform 2 to 1 slopes of an average height of approximately 40 feet and the soil is a light sandy gravel. In the autumn of 1941, the slopes in the Town of Tolland were covered with 6 inches, loose measurement, of hay mulch, over which was applied 2 inches of loamy topsoil, 5-8-7 commercial fertilizer at the rate of 20 pounds per 1,000 square feet, and the regular roadside grass-seed mixture at 3 pounds per 1,000 square feet. A well-established turf has resulted.

In the fall of 1942, the slopes in the Town of Willington were given the same treatment as those in Tolland, with the exception that a somewhat lighter covering of the material existing on the slopes was used to cover the mulch instead of loamy topsoil. A very satisfactory turf resulted, although not as dense as on the Tolland slopes and also some weed growth is apparent.

On the north side of the highway, both in Tolland and Willington, fertilizer was applied in liquid and dry forms at the rate of 20, 40, and 60 pounds of nitrogen per acre. Areas of comparable size on the south side of the highway in both towns were given the same treatment. The following sample tabulation shows the pattern followed throughout:

North Side—Route 15—Wilbur Cross Highway—Tolland			
Plot Number	Size (Feet)	Pounds Per Acre	Type of Application
1	100 x 22	20	Liquid
2	25 x 30	Check Plot	None
3	30 x 45	20	Dry
4	25 x 45	Check Plot	None
5	100 x 45	40	Liquid
6	25 x 45	Check Plot	None
7	50 x 45	40	Dry
8	25 x 45	Check Plot	None
9	100 x 45	60	Liquid
10	25 x 45	Check Plot	None
11	50 x 40	60	Dry

At the suggestion of Dr. John Monteith, Jr., ammonium nitrate was used for the fertilizer. It is exceedingly high in nitrogen, 32.5 per cent, and readily soluble in water. It was applied in liquid form by means of a Bean Royal 55 high-power sprayer at a constant pressure of 250 pounds at the nozzle. It was noted that the solution corroded the brass parts of the spray nozzles quite badly, but no injury to other metal parts of the machine was apparent.

The fertilizer applied in dry form was first mixed with dry sand in such proportions that it could be spread by hand at the rate of 20 pounds of mixture per 1,000 square feet and at the desired rates of nitrogen per acre. The cost of applying the fertilizer in dry form by hand was \$7.53 per acre, while the

liquid form was applied at \$3.71 per acre.

John L. Wright, Director of Roadside Development, Connecticut State Highway Department, reports that no additional information as to the effectiveness of the use of liquid fertilizer was available due to an unprecedented spell of dry weather in Connecticut, which was most unfavorable for plant growth. A definite advantage in the use of liquid fertilizer, however, is its greatly reduced cost over dry fertilizer applied by hand.

LeTourneau Distributor Changes Name of Company

The name of the company representing R. G. LeTourneau, Inc., Peoria, Ill., in the Atlanta, Ga., territory has been changed from the Contractors Equipment & Supply Co. to the Gill Equipment Co. This firm, headed by S. E. Gill, is located at 1281 LaFrance St., N. E., Atlanta, and handles the complete line of LeTourneau dirt-moving and allied equipment.

Equipment Item Lists Are Published Monthly

Each month an Industrial Availability Booklet showing items available on priority for immediate delivery from stock is published by Walker-Jimieson, Inc., 311 South Western Ave., Chicago 12, Ill. This company distributes radio and electronic equipment, but its booklet, the October issue of which contains 32 pages

of items, lists such material used by highway-department and contractor shops as electric soldering irons, industrial switches, steel tool-room equipment, electric drills, saws, and grinders.

Walker-Jimieson offers to send this monthly booklet free to equipment engineers or purchasing agents who are readers of CONTRACTORS AND ENGINEERS MONTHLY and who mention this item in writing on their official letterhead.

Engines FROM 90 to 215 HP. Generators FROM 60 to 115 KW

More Power

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More Profit

MURPHY DIESEL COMPANY, 5319 W. Burnham St., Milwaukee 14, Wis.

GOOD WORKMEN DESERVE GOOD TOOLS

BARCO

PORTABLE GASOLINE HAMMER

Why pay good wages, then slow down a man's output with inefficient tools? Barco Portable Gasoline Hammers were designed and perfected to enable good men to do more work... with less hardship on the worker. And Barcos have proved they pay a profit on hundreds of different jobs... saving time, speeding the work, keeping workers better satisfied. Rugged yet light and easily portable. Eleven special attachments. For full particulars, write to: The Barco Manufacturing Company, Not Inc., 1818 Winemac Avenue, Chicago 40, Illinois.

BREAKING DRILLING DRIVING TAMPING

In Canada: The Holden Co., Ltd., Montreal

The Free Enterprise System Is The Salvation of American Business



The new Pro-Tecto-Cape for welders.

New Welders' Cape Gives Full Protection

A new garment which gives full protection to welders, no matter in what position they may be working, has been announced by the Industrial Safety Division of the Eastern Equipment Co., Willow Grove, Pa. This Amcoweld Pro-Tecto-Cape is made of high-grade durable chrome leather, incorporating under-arm flaps and a collar which may be turned up, so that the wearer is completely protected even when doing overhead welding. The collar is securely held in an upright position by means of special tabs and a snap fastener. In addition, the design provides freedom of movement and ventilation. The front bib is equipped with snap fasteners for easy removal.

Complete information, including prices of the new safety garment, may be secured direct from the manufacturer by mentioning this illustrated item.

New Crane-Excavator For Post-War Jobs

Radical changes in design characterize the new combination crane-excavator developed by the General Excavator Co., Marion, Ohio, according to a recent announcement. Formally designated as the General Type 10, but referred to as the "Machine of Tomorrow" by the manufacturer, this new piece of equipment was developed after five years of experimentation with self-propelled pneumatic-tired excavating and materials-handling machines with the purpose of producing a rig sufficiently versatile to handle both excavating and construction work.

Details of the General Type 10 crane-excavator will not be divulged until after the war but, according to the manufacturer, it will revolutionize small construction, excavating and materials-handling jobs, and permit contractors to handle profitably a broader range of miscellaneous work.

Lidgerwood Acquires Interest in Stokers

Lidgerwood Mfg. Co., Elizabeth, N. J., which for 71 years has been a manufacturer of heavy-construction, marine auxiliary, and tunneling and mining equipment, has acquired the manufacturing and sales rights and all interests in the Whiting and Butler stokers, Whiting horizontal compression feed stokers and Continental stokers which are now manufactured by the

Whiting Stoker Co. of Chicago, Ill. This is part of a move to expand and diversify Lidgerwood activities in preparation for the post-war period.

V-Belt Drive Data

A new 44-page handbook on industrial fractional horsepower V-belt drives has just been published by The B. F. Goodrich Co., Akron, Ohio. The booklet notes the trend toward larger sheaves in both fractional horsepower and multiple V-belt drives, describes the construction of B. F. Goodrich fractional horsepower V-belts, and gives prices and data on both sheaves and belts.

One of the most valuable portions of the handbook is the chapter on proper selection of FHP belt drives, with formulae, together with a page on how to get the most service from V-belt drives. Copies of this handbook may be secured without cost direct from Goodrich by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Post-War Possibilities In Dirt-Moving Costs

Citing specific extra-yardage comparisons and greater speeds, illustrated with numerous job pictures, a new post-war pamphlet, just issued by R. G. LeTourneau, Inc., Peoria, Ill., tells how Tournapulls will enable a contractor to stay in the bidding and make a profit by moving

big yardages of dirt fast on such post-war jobs as relocating and widening highways, lengthening airports, and building earth dams.

Copies of this new 8-page pamphlet, No. TT-119, tells the story in figures and pictures and will be sent promptly to readers of CONTRACTORS AND ENGINEERS MONTHLY writing direct to the manufacturer at Peoria.

EXPANSION JOINTS

For your requirements in Airport Runways, Dams, Bridges, Highways, Base Pavements and general work, Serviced Asphalt, Fiber, Cork and Self-Expanding Cork are recognized as a good construction practice.

Manufactured to comply with all Federal, State and Railroad Engineers' Specifications.

Pioneers in the manufacture of Construction Materials for over twenty-three years.

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All signs indicate—MORE CAR OWNERS GO TO
CHEVROLET DEALERS FOR SERVICE THAN TO ANY
OTHER DEALER ORGANIZATION.

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MODERN TOOLS AND
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All reports show—MORE TRUCK OWNERS GO TO
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All reports show—1 OUT OF EVERY 4 CARS AND 1 OUT
OF EVERY 3 TRUCKS SERVING WARTIME AMERICA—
IS A CHEVROLET.
BUY MORE BONDS... SPEED THE VICTORY



SEE THE LEADER FOR SERVICE
AND YOU'LL GET BETTER SERVICE!

CHEVROLET MOTOR DIVISION, General Motors Corporation, DETROIT 2, MICHIGAN

SEE YOUR LOCAL CHEVROLET DEALER FOR SERVICE



Complete line of
gasoline, pneumatic and electric driven con-
crete vibrators and grinders

Write for information and prices

ROETH VIBRATOR COMPANY

1737 Farragut Ave.

Chicago, Ill.

Full Guard-Rail Data For Highway Engineers

Unusually complete technical information on a simple easily installed steel guard rail weighing only 6.56 pounds per running foot is included in the new plastic-ring-bound 30-page Bulletin No. 47 issued by Sheffield Steel Corp., 1938 Shephard Ave., Kansas City 3, Mo. Sheffield manufactures Flex-Beam guard rail, the present form being a development resulting from constant research which began in 1933. It is made of 12-gauge steel, corrugated so that a section freely supported on 12-foot 6-inch cen-

ters will carry a load of over 2,000 pounds at the center, deflecting over 3 inches without permanent distortion.

Complete information with illustrations, specifications, prices, and tests will be found in Bulletin No. 47 which may be secured by highway engineers writing direct to the manufacturer and mentioning this review.

Inventor of One-Piece Forged Shovel Retires

After 50 years devoted to making and designing hand shovels, "Arch" Milligan is retiring as Manager of the Dun-

kirk Works of The American Fork & Hoe Co. at Cleveland, Ohio. Mr. Milligan is the inventor of the patented process of forging shovels in one piece from a solid bar of steel and developed the one-piece solid-shank shovel used throughout the country.

Born in Scotland in 1879, he entered the shovel manufacturing trade at 15. When he was 30 he went to Canada where he was employed by the Canadian Shovel & Tool Co. of Hamilton, Ontario, as general foreman in charge of forging. Then he was promoted to superintendent in charge of all manufacturing operations. In 1924 he became Manager of

the Skelton Shovel Works, Dunkirk, N. Y., now a Division of The American Fork & Hoe Co.

A.R.B.A. Plans Meeting In Chicago in January

"Action" is the theme of the Forty-Second Annual Meeting of the American Road Builders' Association to be held at the Stevens Hotel, Chicago, January 16-19, 1945. Plans for launching the greatest highway program in the history of the nation will be aired from every angle, with outstanding authorities from government and industry participating.

**THICK
or THIN
-HOT
or COLD**



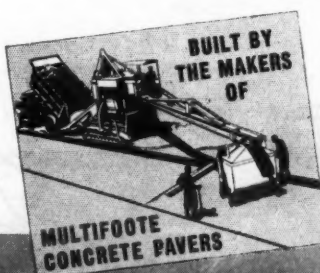
It's all the same to an ADNUN

You can lay any mix—hot or cold—any thickness—any width—with an Adnun Black Top Paver. Its exclusive method of Continuous Course Correction automatically assures more accurate distribution and depth of material as well as smooth finished surface. The Power Cut-Off, with hydraulically controlled gates provides positive control of the flow of materials and prevents grade inequalities. Overlapping action at the Cutter Bar produces a tight joint at the curb or against the paralleled courses. Hydraulic controls mean fatigueless operation.

Adnuns lay crushed stone or slag accurately and fast in single courses as deep as 6" or better or sheet asphalt only a fraction of an inch thick. Black top paving laid by Adnuns is noted for maximum density, tight joints between strips, smoothest finished surface, and all-weather durability. Adnun Black Top Pavers were first in the field and still lead in performance. Write today for literature.

THE FOOTE CO., INC., Nunda, New York

The World's Largest Exclusive Manufacturers
of Concrete and Black Top Pavers



ADNUN
TRADE MARK REGISTERED
BLACK TOP PAVER

WITH CONTINUOUS COURSE CORRECTION

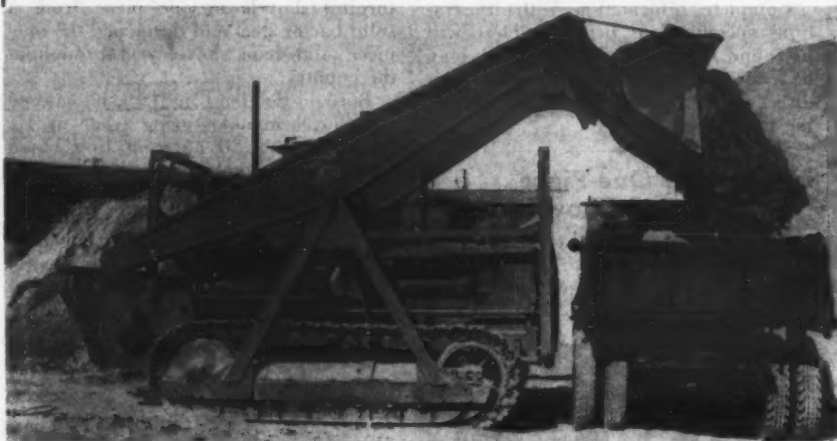
Marker Outfits Available

United States Army mine marker outfits are being offered for sale now by the Treasury Department. The outfits consist of 30 metal danger signs with a 4 x 5-inch steel flag mounted on a 20-inch steel shaft. The word "danger" is in black superimposed on a yellow chrome background with a 3/4-inch white reflector margin on both sides of the top borders. A weatherproof carrying case of cotton duck is included. The size of the case is 8 1/2 x 20 inches.

These outfits should be of interest to road maintenance crews.

The outfits sell for \$3.85 in lots of 48. Shipment will be made from the Regional Treasury Procurement Office in any of the following cities: Fort Worth, Cincinnati, Chicago, Washington, D. C., Atlanta, New York, San Francisco and Denver. Orders must be accompanied by shipping instructions and a certified check made payable to the Treasurer of the United States.

McCAFFREY TRACTOR SHOVEL



For sizes and specifications of this unit write to:

M. P. McCaffrey, Inc.

2121 EAST 25TH ST.
LOS ANGELES 11, CALIF.



- 1 1/2-yard capacity bucket.
- 100% cable control of bucket.
- Weight centered on truck frame.
- Design permits bucket to reach over center of the truck.



HAVE THESE QUESTIONS PUZZLED YOU?

Geo. M. Etnyre

The men in our organization have been working under pressure for the past three years to build "Black Toppers" and Sanitary Street Flushers for our Armed Services and Allies. That the Army and Navy think we have done an excellent job is evidenced by the "E" Award. But meanwhile, there have been questions raised about our civilian production which you may be wondering about. And I wish to take this opportunity to end idle rumors and give you the true facts:

Is Etnyre too busy with war contracts to handle civilian orders?

No! In tooling up for greatly expanded war production of "Black Toppers" and Street Flushers, our capacity has been greatly increased. This fact, coupled with recognition by the war agencies of the need for equipment to build, maintain and clean roads and streets, has made it possible for Etnyre to make distributors and flushers for urgent civilian use even while deliveries are flowing steadily to the Armed Forces.

Can orders be placed now for Etnyre "Black Toppers" and Flushers?

Yes! Make application to your nearby Etnyre dealer or to us for complete information.

How about new models?

Battlefront operation gave Etnyre products the "acid

test". We are proud to admit that Etnyre designs and construction stood up under the most grueling grinds of 24-hours-a-day operation for weeks at a stretch, in all climates of the world. Even so, from time to time improvements were made to simplify operation, incorporate new safety features, or increase efficiency. Today we are ready to build all of these tested features—both old and new—into Etnyre models.

Have Etnyre Spray-Bar patents run out?

No! Etnyre still holds U. S. patents on Spray-Bar design and construction which makes possible unequaled efficiency in the application of asphalt, cut-backs, tar, road oils and emulsion. Millions of gallons have been applied in years of black-topping service. Actually, these Spray-Bar design superiorities have been one of the big reasons why the Etnyre is the favorite of highway departments, contractors and operators. Infringements of these patents will be prosecuted.



Free NEW BOOKLET ON POST-WAR ROAD BUILDING

Get your free copy of this outstanding new booklet... statistics on road-building in the U. S. A. ... costs of construction and maintenance... charts on how a modern highway can be made to pay for itself in license fees and taxes. Write, wire, or phone for your copy today!

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Porto-Batcher
SAVES A LOT of
TIME and MONEY



Quickly Set Up for Operation at the Most Advantageous Location

The Johnson Porto-Batcher is a complete highway portable batching plant. Its use permits these substantial time and money savings:

1. The Johnson Porto-Batcher can be towed behind a truck to the most advantageous point in the pouring area.
2. Since the Porto-Batcher is quickly set up for operation, long hauls of mixed concrete are eliminated... the number of mixing units is reduced and the number of concrete yard miles lessened. Control of all operations is centralized.
3. All materials are delivered to the batching unit in bulk material trucks... eliminating extra handling equipment.
4. The Johnson patented charging skip permits full utilization of mixer capacity. By providing proper intermingling of aggregates with cement when discharged into mixer, it assures pre-mixing and pre-shrinkage... prevents cement from touching wet mixer opening and walls thus eliminates gumming and excessive wear.
5. All levers are grouped in one central location to permit control of operations by one man. Write for bulletin.

Write for data on Ready Mix Plant • Bulk Cement Handling Equipment • Cement Storage Bins • Concrete Buckets • Batchers



The C. S. Johnson Company
Champaign, Illinois

Avoid Legal Pitfalls

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Edited by A. L. H. STREET, Attorney-at-Law.

Unexpected Difficulties Met on Excavating Job

Our country is getting old enough to have layers of forgotten "civilization" buried just below the surface. So the excavating contractor must foresee the possibility of encountering artificial conditions as well as unexpected rock formation. There is no telling what kind of hard luck may await the unwary contractor.

We offer as an example a case that was lately decided by the Missouri Supreme Court, where a state highway grading subcontractor did not scrape far below Mother Nature's epidermis before finding parts of an old suburban railroad. There were a trestle, concrete bases for trolley poles, and other obstacles to the use of elevating grader equipment.

The State Highway Commission did not know of this condition, which entailed extra cost of approximately \$10,000 in doing the grading.

The liability of the Missouri State Highway Commission to make good the extra cost was upheld by a trial judge in St. Louis, but the Supreme Court upset the decision. (*Webb-Boone Paving Co. v. State Highway Commission*, 173 S. W. 2d, 580.)

The case turned upon the facts that the State did not know of the obstacles and did not guarantee or misrepresent subsurface conditions; that the contractor had certified that he had examined the site; and that the contract provided that the agreed compensation should cover "all loss or damages arising out of the nature of the work or from any unforeseen difficulties or obstructions," etc. The court said:

"The case is one of misfortune rather than one of misrepresentation. The contract left it to the bidder to satisfy himself as to the conditions attending the specifications of the road-way excavation without any warranty, express or implied, on the part of the Commission as to the possible subsurface conditions."

Breach of Agreement On Equipment Rental

The lessor of a centrifugal pump for use on a highway won out on each of several items of damage claimed by him for breach of the lease agreement, in a case decided by the Louisiana Court of Appeal. (*Makofsky v. Department of Highways*, 12 So. 2d, 485.)

The contract in question called for a six months' lease at a \$300 rental, and provided for return of the pump to the lessor at his place of business in New Orleans, "in first-class working order". It was decided that return of the pump to a railroad for shipment to the lessor a month after the pump was received constituted a violation of the contract, rendering the lessee liable for the full \$300 rental, as damages. It was also decided that the lessee was liable for the return freight charges and for damage done the pump in return transit.

The lessee relied upon a clause in a contract form which it had furnished the lessor for use in making the agreement, entitling the lessee to cancel the contract at will. But the court upheld the lessor's contention that this clause was superseded by correspondence between the parties, indicating mutual agreement that the lease was to run for a full term of six months.

Readiness of Site

By the time attorneys' fees and court costs are paid, roughly a million dollars will be involved in the outcome of the case of *H. W. Nelson Co. v. Grand Trunk Western Railroad Co.*, lately before the United States Circuit Court of Appeals, Sixth Circuit. (116 Pac. 2d, 823.) The suit was brought by the plaintiff company to collect damages growing out of a delay through the railroad company's tardiness in providing right-of-way for railroad grading and construction. What the court decided has broad application to all sorts of construction jobs where work is delayed by the owner's failure to provide the necessary site. Here are a few of the seventy-one points decided by the court:

A contract clause, providing that the contractor should enter upon parts of right-of-way acquired and should make no claim for delay as to parts not acquired, did not absolve the railroad company from liability for damages caused the contractor through misrepresentation that substantially all of the right-of-way had been acquired. Innocence in making the misrepresentation would be no excuse.

On discovering that the owner has made misrepresentations affecting performance, a contractor, who has partly performed before discovering the falsity of the representations, may choose between rescinding his contract and claiming damages or continuing and earn-

ing the agreed compensation. But "a contracting party claiming to have been defrauded may not continue in the performance of a contract or enter into a new agreement in relation to its subject matter without waiving the fraud."

The Right to Interest On Delayed Payments

"While the general rule is that interest is not to be awarded against the State unless expressly provided by statute or the terms of the contract, however, in this contract the State agreed to pay for everything furnished thereunder promptly upon the completion and acceptance of the work and, having failed to do so, should pay interest thereon from the date of the acceptance." So declared the Nebraska Supreme Court in a case involving a road surfacing contract. (*Appeal of Road-mix Construction Corp.*, 9 N. W. 2d, 741.)



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The feature of this control is that the spray can be started on an exact line automatically from the cab.

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automatically synchronizes pump RPM with truck speed. Provides accurate distribution.

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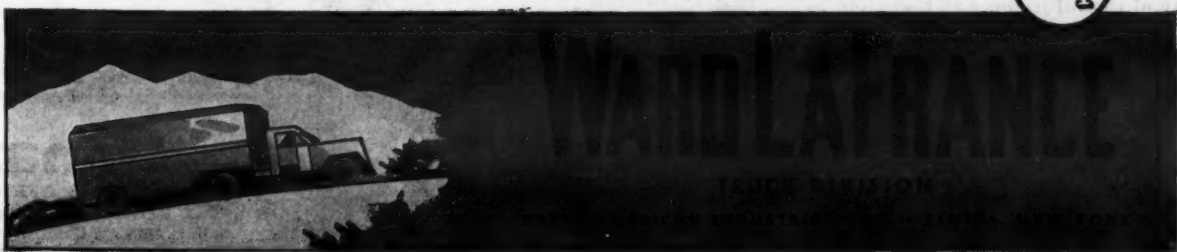
Gentlemen:
An American Army officer told me of the hard knocks and strains encountered daily by some of your heavy equipment. In hauling over trails impossible to negotiate with some of the regular Army models supplied by one of your well-known competitors, and aroused my curiosity to the point of writing for literature about Ward LaFrance non-military vehicles.
I would especially like illustrations or specifications concerning your heavy-duty gasoline and Diesel powered commercial models used in over-the-road transportation operations. Any information you may care to mail me would be gratefully appreciated and I can assure you it will pass into hands that may be vitally interested in Ward LaFrance as a possible solution in trucking problems.

Very truly yours
Instructor, Operation
Heavy Transportation Equipment

This letter is typical of numerous unsolicited commendations, received from men who know trucks and who have seen Ward LaFrance military models at work at the fighting fronts.

We have been authorized to resume the manufacture of a limited number of civilian trucks during 1944, but, of course, military demands for Ward LaFrance trucks come first. When Ward LaFrance civilian models do become available, they will offer

an unusual opportunity to standardize on trucks known the world over for extra stamina and dependability... on a unique plan which no fleet owner will want to overlook. For further details, write our Sales Department today.



Disabilities Need Not Disqualify Veterans

(Continued from page 8)

his application with us.

"We realize that our main problem will be in placing disabled veterans in positions, to prevent their becoming an economic loss to themselves and their community. In connection with the preparation of our Manning Tables, we have made a study of our own organization to determine what positions are being satisfactorily filled by employees who are physically handicapped.

"Our first questionnaire included the question: 'Does the employee have any physical disability; if so, what?' A review of the answers obtained indicated that our question was probably not properly worded as we did not learn if the disabled person was being assigned special duties because of his handicap. We therefore submitted a new questionnaire which included the question: 'Does the employee have a physical defect which must be considered when assigning his duties?' Many of the first disabilities were not reported and a study of the two results showed that employees with amputated hands, crippled hands or arms, amputated legs or feet, fingers missing, crippled from paralysis and other disabilities were not reported in the second instance. It appears that many employees who have some apparent physical disability have overcome the disability to the point that they can satisfactorily perform the duties of their positions.

"Physically disabled persons whose disabilities are not being considered in assigning their duties are satisfactorily filling the following positions with the department:

"**Clerical Positions:** crippled from paralysis, one leg shorter than the other, lameness (other than from preceding causes), thumb missing, and two and three fingers missing.

"**Engineering Positions:** crippled from paralysis, lameness (other than from paralysis), two and three fingers missing, hand amputated, crippled hand or arm.

"**Mechanics:** crippled from paralysis, lameness (other than from above), and thumb missing.

"**Timekeeper Clerks:** crippled from paralysis, one leg shorter than the other, leg amputated.

"**Laborers:** crippled from paralysis, one leg shorter than the other, lameness (other than from above), two and three fingers missing, hand amputated.

"**Equipment Operators:** one leg shorter than the other, lameness (other than from above), thumb missing, two and three fingers missing, crippled hand or arm.

"**Leading Men, Foremen and Superintendents:** crippled from paralysis, one leg shorter than the other, lameness (other than from above), two and three fingers missing, foot amputated, crippled hand or arm.

"It is apparent that there is a distinct difference in the ability of the individual to overcome certain physical defects. In other words, one man can satisfactorily and efficiently perform a certain job under certain handicaps, such as the loss of a hand, while another man with the same disability is apparently unable to overcome it. This emphasizes the necessity of careful training and selection in the placing of disabled veterans. For example, a man who does not possess a high degree of muscular coordination can probably never perform work requiring muscular skill, and should be in a field where this is not of prime importance.

"We believe that a constructive assignment will be available for everyone of our employees who is in the service,

and we hope to place many other physically disabled veterans who were not previously in our employ, and are continuing our study to this end."

According to J. H. Dowling, State Highway Engineer of Florida, the State Road Department of Florida expects to do its part in putting returned veterans, both the able-bodied and the physically handicapped, to work. While no broad survey has been made to determine just what jobs could be handled by persons with various classes of disability, Mr. Dowling feels confident that 60 per cent of the administrative and clerical jobs would be in this category.

Mr. Dowling reports: "Even before the present emergency arose, the Department had some experience in employing physically handicapped persons in such jobs as draftsmen, auditors and clerks. The shortage of man-power obtaining during the war has naturally resulted in increasing the number of such employees. We recently had occasion to hire a one-armed discharged veteran of

(Continued on next page)

GEERPRES Mop Wringer

reduces mop costs from 25 to 50% over other methods of wringing—retains the mop fabric in a soft fluffy condition most desirable for rapid mopping. No more loose mop strings to catch around legs of desks and furniture when using GEERPRES.

New construction makes this wringer last for many years. Two popular sizes cover the entire commercial field. No. 1624 model will wring mops 14 to 24 oz. incl. No. 2436 model will accommodate mops 20 to 36 oz. incl. SEND FOR FREE CIRCULARS.

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On either new or modernized equipment, Climax engines help provide that extra dependability and low cost operation profitable to maker and contractor. For portable service, the engines are compactly designed, light in weight and highly flexible. They operate with equal efficiency on natural gas, butane or gasoline, and

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The Climax Model R6I valve-in-head Blue Streak engine which develops 166 hp. at 1200 r.p.m.—designed for operation on natural gas, manufactured gas, butane, gasoline, sewage gas or other fuels.

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Jobs for Veterans In Field of Highways

(Continued from preceding page)

this war as a traffic counter, as well as a young lady handicapped by deafness. We also have on the rolls at this time some operators of stationary engines who have legs missing, one-handed draftsmen, and clerks with different kinds of disabilities, none of which interfere to any great extent in their duties. We have found that these handicapped persons, if otherwise suitable, make splendid employees.

"Your editorial on this subject in the March issue was timely and full of merit. I feel sure it will stimulate some planning along the lines suggested, and agree that the mental and emotional as well as the physical healing of returned disabled veterans will be speeded up if they are assured of useful employment. I think, however, that each returning veteran, and especially the disabled ones, should be given an opportunity of training, retraining or additional education before being required, or even encouraged, to take just any job for which he is qualified upon discharge from the service. As there are comparatively few manual tasks which can be performed as efficiently by a physically handicapped man as by an able-bodied one, I think every effort should be made to train as many of them as have native ability for jobs requiring mental, rather than physical, ability.

"The fitting of them for a job of a higher level than that they were qualified to hold before taking up arms to defend their country would, I feel certain, instill in the disabled veterans a high morale and make them much more useful citizens."

Similar statements of opportunities for disabled veterans have come from other state highway departments. Many such departments, of course, operate within the limitations of civil service requirements, but most of them are making definite plans for providing jobs, not only for their former employees who return whole in body and mind, but also for those with permanent handicaps.

Most encouraging are the reports of the satisfactory experiences which state highway departments have had with employees with physical defects and the number of types of jobs in which these defects are not a handicap. M. J. Hoffman, Minnesota Commissioner of Highways, writes:

"We have at the present time several persons who have been disabled either in the first World War or in industrial accidents and who are doing efficient work as engineers, draftsmen, clerks, and in various other capacities. One of the most efficient project engineers this Department has ever had was a man who had an artificial leg and who was employed in field engineering for more than twenty years. When the war ends and construction is resumed so that our personnel will be increased, we shall probably be able to employ many more such persons."

A suggestion for another type of

work suitable for disabled veterans comes from W. H. Root, Maintenance Engineer, Iowa State Highway Commission, who says: "One type of highway work which these men might do is the care of equipment. We have had some very good mechanics who were physically handicapped but were able to overcome these handicaps and proved to be very high-class mechanics."

In the County Field

Many of the same types of jobs which are open to men with permanent disabilities in state highway departments are available in county highway organizations. In addition, the county engineer organizations in many states embrace considerable more activity than road building and maintenance, thus offering an even wider scope in jobs.

H. J. Friedman, Engineer-Director, Glynn County, Georgia, feels that disabled veterans could probably become better adjusted in positions involving maintenance operations rather than construction, as this would often make it

possible for them to become permanently located in rural or suburban areas where they could secure small tracts of land, have gardens and live comfortably and economically.

"In our rather small county set-up," says Mr. Friedman, "there is the definite possibility of using these men on maintenance of our Court House, Court House grounds, as draw-bridge tenders and toll collectors on the St. Simons Highway, operators of County recreational facilities such as the County Casino and bowling alleys, and in highway maintenance, handling mowing machines, and other light equipment.

"While it is my thought that these men will be particularly adapted to maintenance operations," Mr. Friedman goes on, "they can, of course, fit in on construction as well, as timekeepers, costs accountants and subforemen. As they become more experienced, they could advance to the grade of foreman and superintendent. With the power controls now in use on a great deal of road-building equipment, men not too seri-

ously handicapped physically could become skilled operators of such equipment.

"I believe it is a primary obligation on all employers of labor to use the handicapped veterans to the best possible advantage and feel that you are doing a splendid service in inaugurating this movement."

The Contractor's Point of View

While state and county highway departments have indicated great willingness and present planning to make a place for returning veterans, they will be limited by budgets, civil service requirements, taking care of their own former employees, and by their definite personnel needs.

However, it is expected that a large amount of construction, both private and public, will be undertaken in the period immediately following the war, and this should offer further opportunity for returning service men, including those coming back with physical handicaps of

(Concluded on page 82)

LITTLEFORD SUPPLY TANKS



FRAMELESS CONSTRUCTION A NEW FEATURE

Haul Asphalt, Tar, Road Oils, or Emulsion to the job in a Littleford Supply Tank. Don't let the haulage problem slow up your application work—keep the Distributors spraying while the Supply Tanks make the long hauls. Littleford Supply Tanks are designed to do the material hauling more efficiently because they're equipped to take care of all types of materials. They are made with or without heating systems, transfer pumps, etc.

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Air-Transport Growth Fast in Latin America

(Continued from page 47)

length from 5,740 to 8,200 feet, and several smaller runways, according to the Mexican press. The area of the field will be almost twice as large as that of New York's LaGuardia Field, and its passenger terminal will be capable of accommodating 1,800 persons at one time.

As William A. M. Burden, Assistant Secretary of Commerce, has emphasized in his book, "The Struggle for Airways in Latin America", most of the other American republics have mountainous areas, jungles and arroyas which have long retarded adequate ground transportation by highways and railroads. As a result of this and other common features, there was a rapid and early growth of air transportation in almost all of these countries.

"The important place which the airplane has already taken in transportation in Latin America", Mr. Burden explains, "is made clear by the fact that there are as many miles of airlines in the area as there are miles of railroad. In only seven of the twenty republics does railroad mileage exceed airline mileage. Two of the South American countries and every one of the Middle American countries, except Haiti and the Dominican Republic, have more airline mileage per thousand square miles than has the United States."

Mr. Burden then expresses the opinion that Latin America is extremely fortunate in being the first important continent where the air transport system is having a chance to develop unhampered by the existence of what he calls "giant obsolescent surface transport systems". Hence, he doubts if ground transport systems will be built on anything like the scale that they would have if Latin America had already placed huge investments in the older forms of transportation.

This novel dependence on air transport rather than railroads or highways in the interior will probably make the future development of local air transportation in some respects more important to Latin America than the growth of the international system which connects it with other continents.

Air Service in Central America

A possible indication of post-war developments elsewhere in Latin America is the unusual success that air cargo planes have already achieved in mountainous Central America. There Transportes Aereos Centro-Americanos (TACA) and its affiliates are credited with having carried more air cargo than all the domestic United States airlines combined. In 1941, for example, TACA carried 30,161,000 pounds of express and freight, compared with 11,160,000 unduplicated poundage carried by U. S. domestic air carriers. On the other hand, the average distance a shipment was carried in the United States exceeded

500 miles while on TACA the average distance was probably nearer 150 miles.

TACA's success lies principally in the hauling of bulk freight cheaply in regions where surface transportation is difficult. In fact, more than 60 per cent of its income in 1940 was derived from air freight, as compared with less than

3 per cent earned by U. S. domestic air carriers from the carriage of express during the same year. TACA's revenue from mail was some 5 per cent of its total increase that year and from passengers, 31 per cent. TACA's freight revenue for all types of merchandise has averaged 3 cents a pound. The company

does not report ton-mile figures, but representative air-express and air-freight tariffs on TACA's lines, reduced to a ton-mile basis, would be approximately as follows: Managua-Bluefields, 171 air line miles, air express, 98.3 cents (U. S.) per ton-mile; air freight, 49.2 cents per ton-mile. (Concluded on next page)

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Very truly yours,
THE WILLETT COMPANY,
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The Government has authorized a limited number of new Dodge Job-Rated trucks for civilian hauling. See your Dodge dealer at once for trucks to fit your job. See him, too, for dependable truck and car service by trained mechanics using factory-engineered parts!

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- ★ Pay Only Ceiling Prices

Post-War Expansion Of American Airports

(Continued from preceding page)

ton-mile.

Should similar air cargo services be developed elsewhere in Latin America in the post-war period, it would seem apparent that considerable extension of airports and landing fields would be necessary to handle internal trade and trade with neighboring republics.

Sizes of Airports

According to the airport classification standards of the Civil Aeronautics Administration, there will be, at the close of 1944, between 300 and 400 Class III or better airports in the other American republics capable of handling the twin-engined 21-passenger plane which is in general use on the Latin-American main air routes. Some of these airports, the exact number of which must be withheld for reasons of military security, already are in the Class IV category, equipped to accommodate the largest planes now in use and those planned for the immediate future. Construction is now under way or planned to create more Class IV airports.

Under the CAA's airport standards, a Class III airport has landing strips 3,500 to 4,500 feet in length at sea level, and is suited for the safe handling of present-day transport planes. Planes in this classification are represented approximately by those between 10,000 and 50,000 pounds gross weight, or by those having a wing loading (lbs./sq. ft.) times power loading (lbs./hp) of 230 or over. Approaches to such an airport should be clear within a glide path of 30 to 1 in the case of Class III and also Class IV airports, except for instrument landing runways, for which the ratio should be 40 to 1 from a point 4,500 feet from the beginning of the runway.

Class III airports are recommended for important cities on feeder-line airway systems and many intermediate points on the main-line airways. The general population range for such a port would be from 25,000 to several hundred thousand. On the other hand, the CAA recommends that major industrial centers and important junction points or terminals on the airways systems have Class IV airports.

A Class IV airport must have landing strips sufficiently long to give the safety that landing strips 4,500 feet or more in length would give at sea level, for planes having a gross weight of 50,000 pounds and over, with a wing-loading times power-loading ratio of 230 and over.

For scheduled operations of small transport planes, 3,000 feet at sea level is the minimum length recommended by the CAA at present, and for other scheduled operations 3,500 feet at sea level should be the minimum, according to this agency.

The length of landing strips must be increased for higher altitudes at the rate of approximately 250 feet for each 1,000 feet above sea level. This is because the atmosphere becomes more rarefied and transport planes need to make a longer run in taking off.

New Monthly Bulletin On Maintenance Items

A new series of monthly technical bulletins entitled "Timely Topics" which are to be devoted to discussions of concrete construction and maintenance problems has been announced by the Department of Industrial Research, L. Sonneborn Sons, Inc., 88 Lexington Ave., New York 16, N.Y.

The first bulletin discusses the use of Sonomend with cement and sand to furnish an elastic material for filling in defective joints in concrete roads, pave-

ments, retaining walls and other forms of concrete construction. It also contains a discussion of expansion-joint problems and describes the proper methods of using Sonomend.

Copies of this and subsequent issues of "Timely Topics" may be obtained by readers of CONTRACTORS AND ENGINEERS MONTHLY writing directly to Sonneborn on their business stationery and mentioning this item.

Municipal Machinery Co. Appointed Dealer for P&H

The Harnischfeger Corp. of Milwaukee, Wis., has announced the recent appointment of the Municipal Machinery Co., Coram, N. Y., as distributor of P&H excavators and truck cranes for the whole of Suffolk County, Long Island. The new agency will handle machines of $\frac{3}{8}$ -yard up to and including $2\frac{1}{2}$ -yard sizes, and will render a complete distributor service on all P&H gasoline and diesel units already installed in the territory.

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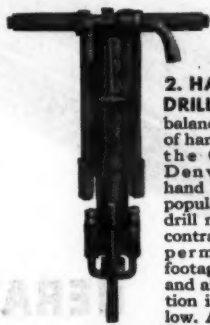
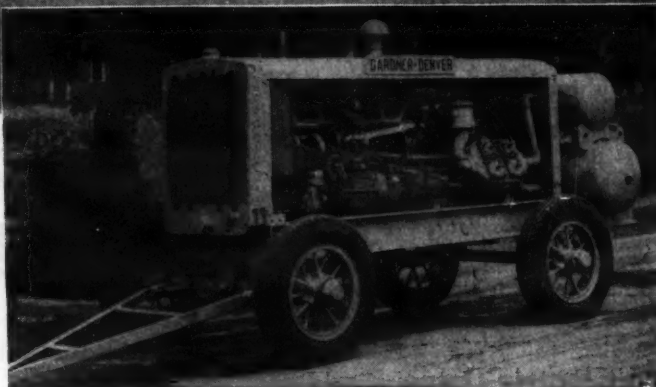
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Perfect balance and ease of handling make the Gardner-Denver line of hand held drills popular with both drill runners and contractors. They permit faster footage per shift, and air consumption is extremely low. Available in five sizes from 28 lbs. to 80 lbs.



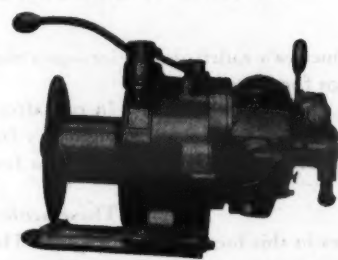
3. PAVING BREAKERS.

With plenty of power for the toughest jobs, the powerful, rugged Gardner-Denver line of paving breakers is ideal for concrete breaking and heavy demolition work. They deliver a fast blow with a minimum of recoil.



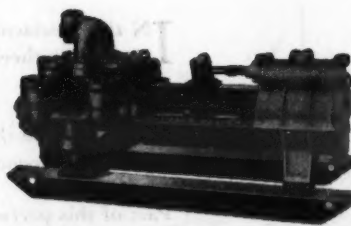
4. SPADERS

Gardner-Denver Spaders have a wide variety of uses ranging from digging in stiff clay to cleaning out frozen material in railroad and mine cars. They are economical in operation and low in air consumption and can be equipped with a number of different bits.



6. AIR HOISTS.

Even pull at all speeds is assured by the five cylinder radial air motor of Gardner-Denver Air Hoists. They waste no power. They have proved a big help in speeding a variety of lifting and erecting jobs. Available in a number of sizes and capacities.



7. GROUT PUMP.

Long dependable service is assured by the sturdy construction of Gardner-Denver Grout Pumps. "Slush-proof" patented rubber pistons—high carbon, alloy steel fluid piston rods—extra heavy valve cover plates and rugged frame—all mean high efficiency regardless of operating conditions.

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Cleaning Rusty Steel With Acetylene Flame

Recent developments in so-called flame priming and descaling with an acetylene flame to remove rust scales from steel plate and structural shapes to prepare them for painting have been followed with interest by maintenance engineers responsible for the care of steel bridges and other steel structures. Victor Equipment Co., 844-54 Folsom St., San Francisco 7, Calif., has announced a new Victor Standard Descaling Attachment which is easily attachable to any standard Victor welding torch butt.

This flame priming and descaling nozzle is provided with a spiral mixer and gas proportioner to handle with greater efficiency the larger gas volumes required for these operations. This mixer device assures freedom from back-fire or flash-back. In order to keep pre-mixed gases below ignition temperatures, even within the proximity of the ribbon flame and deflected heat, an aluminum cooling section is incorporated in the nozzle head. Replaceable Meehanite skid shoes with properly shaped lugs add substantially to the wearing life of this nozzle and allow it to be dragged at any suitable angle over the metal surfaces.

The Victor nozzle is made in 4-inch and 6-inch ribbon flame widths. For inaccessible areas or rivet heads, special circular multi-flame nozzles are available.

Gas, Electric-Drive Concrete Vibrators

The placement costs of mass concrete of low water-cement ratios can be cut more than 50 per cent under the old hand method by the use of concrete vibrators. WYCO flexible-shaft-drive concrete vibrators are built by Wyzenbeek & Staff, Inc., 838-842 W. Hubbard St., Chicago 22, Ill., for electric-motor drive and with gasoline power units, the latter mounted on a wheelbarrow or on a stationary swivel base.

The hardened spud vibrator head on WYCO machines has a nose of hard alloy steel, the head is completely sealed against grease, dirt or water, it has a cast-steel rotor running in two Norm-Hoffman roller bearings and one ball thrust bearing, and has a protected oil plug for change of oil in the vibrator head when needed.

Electric-motor drive for these vibrators is of three types. For alternating current, single or three-phase constant-speed models in two types are available, either a direct-connected type running at 3,450 rpm or a geared step-up type with speeds of 6,900 or 7,200 rpm. For both alternating and direct current a universal motor is supplied, with an idle speed of about 7,500 rpm, subject to variation of speed according to load. The gas-engine power unit for WYCO vibrators is a standard air-cooled engine with a ball-bearing jack shaft and two V-belts, housed in a metal guard. The vibrators are equipped with a simple patented jack-shaft clutch which is manually operated and which completely disengages the engine, thereby prolonging the life of the flexible-shaft core. The engine

is completely free-wheeling when the clutch is released, making starting of the engine quick and easy. Gasoline-engine-driven vibrators are supplied with speeds from 6,000 to 7,200 vibrations per minute.

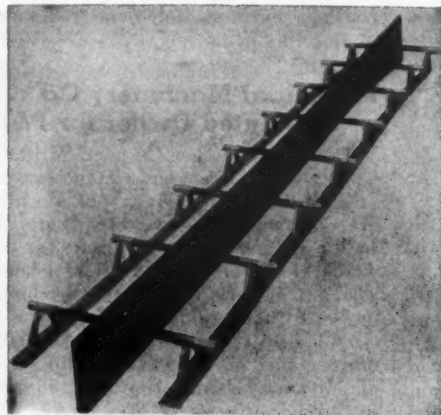
Complete information on WYCO concrete vibrators may be secured direct from the manufacturer.

Changes in Operating Staff of Steel Company

The Wickwire Spencer Steel Co., manufacturer of wire and iron fence, highway guard rail, wire rope and similar material, announces three important changes in its plant operating personnel. M. G. Werme has been appointed Chief Development Engineer; Gordon Lloyd, Superintendent at the Clinton, Mass., plant; and Victor Chartner, Chief Mechanical Engineer with headquarters at Buffalo. Mr. Werme, who has been with the company for twenty-five years, formerly held the position now filled by Mr. Lloyd at Clinton.

For ease of assembly and speed of installation of expansion and contraction joints

use **TRUS-ASSEMBLY**



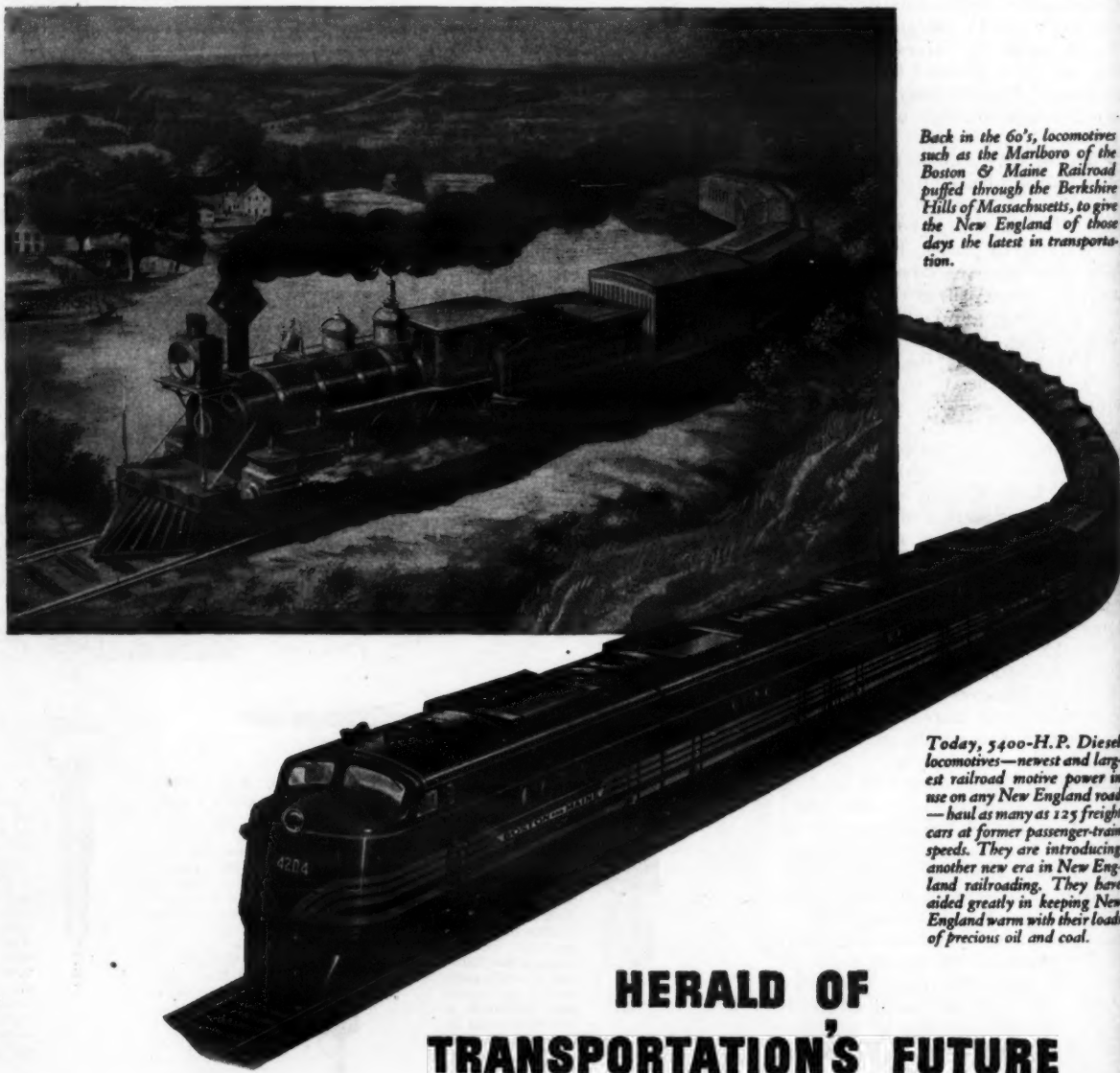
It brings extra profits to the contractor by reducing installation costs to a minimum;

also saves the government money by eliminating maintenance expense caused by inaccurate alignment of dowels.

Write for circular

HIGHWAY STEEL PRODUCTS CO.

Chicago Heights, Illinois



Back in the 60's, locomotives such as the Marlboro of the Boston & Maine Railroad puffed through the Berkshire Hills of Massachusetts, to give the New England of those days the latest in transportation.

Today, 5400-H.P. Diesel locomotives—newest and largest railroad motive power in use on any New England road—haul as many as 125 freight cars at former passenger-train speeds. They are introducing another new era in New England railroading. They have aided greatly in keeping New England warm with their loads of precious oil and coal.

HERALD OF TRANSPORTATION'S FUTURE

IN the spectacular job America's railroads are doing there is a design for finer future transportation.

It centers upon the performance of the General Motors locomotive.

Part of this performance lies in this locomotive's work. It is quick to get away—carries through its job with few or no stops for service—gets there on clipped schedules.

ice—gets there on clipped schedules.

In run after run these locomotives are hauling heavy freight faster than passengers were carried a few years back.

These achievements are elements in railroad progress. They are forerunners of a great new era of transportation efficiency in the days which lie ahead.

KEEP
AMERICA STRONG
BUY
MORE WAR BONDS



LOCOMOTIVES ELECTRO-MOTIVE DIVISION, La Grange, Ill.

ENGINES . . 150 to 2000 H.P. . . CLEVELAND DIESEL ENGINE DIVISION, Cleveland 11, Ohio

ENGINES . . 15 to 250 H.P. . . DETROIT DIESEL ENGINE DIVISION, Detroit 23, Mich.

Army Airfield Paving With Rolled Concrete

(Continued from page 17)

and had no effect on the ease of placing. A moisture of 7 per cent was maintained on all the work. Using a Vinsol-treated cement, the dry weight of the concrete was 133.2 pounds per cubic foot and the wet weight 134.5 pounds. The work ended with the use of 60 per cent on-site and 40 per cent of the off-site aggregates, as the off-site material was on the coarse side. Cores were not available at the time of our visit so that no strengths can be given at this time.

The plant and labor required for the work at Rome were as follows:

PLANT	
2 tank trucks	
1 diesel-powered motor grader	
1 pneumatic roller	
1 rubber-tire tractor	
1 10-ton tandem roller	
2 2-inch pumps	
1 curing spray machine	
8 4-yard truck mixers	
LABOR	
1 grader operator	
10 truck drivers	
1 roller operator	
1 superintendent	
1 foreman	
1 engineer	
1 tractor operator	
10 laborers	

The concrete at Rome was placed from truck mixers, and was struck off between the forms by a heavy screed pulled over them. It worked satisfactorily as a strike-off but when used to move excess concrete along the subgrade it had a tendency to "ride" the concrete and not move it. This was abandoned and the piles of concrete dumped by the trucks were spread first by a bulldozer, then by hand, and a grader.

The initial rolling was done by a 10-ton tandem roller followed at first by a 1½-ton truck which was unsatisfactory because it required too many passes. As soon as a standard pneumatic rubber-tire roller could be secured, it was placed in service, after which there was a noticeable improvement in the smoothness of the surface. The Federal specifications required that the rolling be completed within one hour of the time of placing the concrete on the subgrade. At the end of rolling, the surface was sprayed with American Bitumuls asphalt emulsion to seal the surface for curing. An asphalt emulsion was used at the request of the Air Corps to give a contrasting color for the gutter area to guide pilots in landing.

Discussion

Many millions of square yards of rolled concrete have been laid in the West under the name "cement-treated base" as applied by the Portland Cement Association to this type of concrete. The U. S. Engineer Department has adopted the name "rolled concrete" for the same process and has issued complete specifications. The largest single job in the East has been the large airport at Hillsgrove, R. I.

Experience of the men who worked on the two jobs under the direction of the Syracuse District Office, U. S. E. D., indicated that the use of truck mixers is liable to cause segregation which was pronounced on the work at Rome. M. R. Smith, Concrete Technician, reports that this was never satisfactorily corrected. In addition, considerable extra labor had to be used in taking care of the rock pockets caused by this segregation. Their experience also indicated that great care must be taken in the completion of the rolling before the initial set begins. As the concrete has no fluidity whatsoever, the rolling starts immediately after the spreading and can be quite quickly completed if care is taken in the operation of the roller. This also applies to the character of the final surface. If the rolling is done so that there is a slight lapping of the rolling lanes, there will be a smoother

surface than if the roller is maneuvered over the surface, tending to roughen it.

This type of paving has been suggested for use on secondary roads where the same smoothness of surface is not required as on main highways. It does not prove satisfactory in surface character nor is it economical unless done in large areas where the work can be carried on as a wholesale operation without any interference.

It was found on the work at Rome, N. Y., that if the sand-aggregate ratio was around 60 per cent, the surface seal was very good. It is not advisable to run the sand-aggregate ratio down to the same point as in regular concrete because there is no grout in the rolled concrete to seal the surface.

At Rome there was, at one time, a large number of piles of concrete ahead of the grader when they were caught with a sudden thunderstorm. The rolling of the concrete after spreading resulted in a poor surface and also in a mixing of the concrete with the subgrade so that the entire slab had to be

removed. This was an unfortunate experience but showed definite limits to what could be done with the material once it contained too much water.

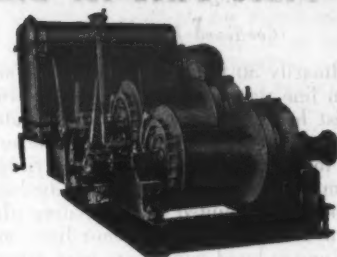
Personnel

The work at Niagara Falls and Rome, N. Y., was done under the direction of the Syracuse District Office, U. S. Engineer Department, Lt. Col. John H. Elleman, District Engineer, and Major F. R. DeLand, Chief of Operations, assisted by Capt. H. E. Belton. M. R. Smith was Syracuse District Concrete Technician, with jurisdiction over both projects.

The rolled-concrete apron at Niagara Falls, N. Y., was laid under the supervision of Major J. J. Bernstein, Area Engineer, with A. R. Argentieri, Concrete Technician. The contractor was Poirier & McLane Corp. of New York City.

The rolled-concrete gutters at Rome, N. Y., were laid under the supervision of Norman A. Nielsen, Project Engineer. The contractor was Bero Engineering & Construction Co. of Rome, N. Y.

OK HOISTS
for every
purpose



As O.K. Hoists are made in many different models ranging from 8 to 150 horsepower, you are sure to get a machine that exactly meets your requirements.

Write for Latest Complete Catalog

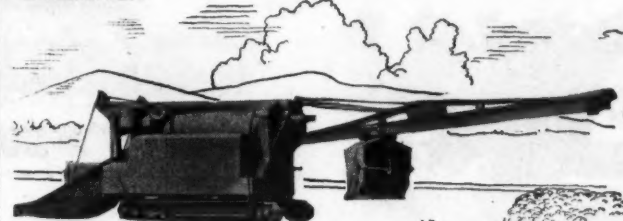
O. K. CLUTCH & MACHINERY CO.
Columbia, Pennsylvania U. S. A.

FOR EFFICIENT-ECONOMICAL

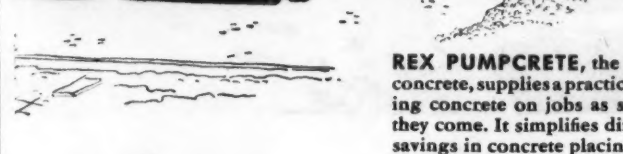
CONCRETE CONSTRUCTION AND MOVING OF WATER



REX MOTO-MIXERS are proved superior by actual job performance and operator preference. Simplicity and ease of operation result in most efficient and economical mixing and placing of specification concrete. Rex Moto-Mixers are available in all standard sizes.



THE REX 34E DOUBLE DRUM PAVER has an unusual performance record for high volume production and smoothness of handling. Operation is controlled by the Rex Mechanical Man, resulting in the fastest possible mixing cycle. The Rex Paver is by far the most modern and efficient paver built.



REX PUMPCRETE, the pump that pumps concrete, supplies a practical means of pumping concrete on jobs as small or as big as they come. It simplifies difficult jobs, effects savings in concrete placing costs and better co-ordinates all operations to permit faster completion of entire job. It eliminates the need for buggy runs, chutes, hoists and towers. Capacities range from 15 to 65 cubic yards per hour.



REX SPEED PRIME PUMPS are high capacity, self-priming, centrifugal pumps used for general dewatering and supply purposes for construction jobs. They are sturdily built, with capacities ranging from 3000 up to 125,000 gallons per hour. Gasoline or electric power operated.

Rex Engineers are specialists in the design, manufacture and application of equipment for mixing, hauling and placing of concrete and the moving of water. Write for illustrated booklets containing the complete facts and engineering data. Address Chain Belt Company, 1666 West Bruce Street, Milwaukee 4, Wisconsin.

CHAIN BELT COMPANY
of Milwaukee

REX

CONSTRUCTION MACHINERY

PUMPS

PAVERS

PUMPCRETES

MOTO-MIXERS

MIXERS

Four Driving Units Place Piles for Dike

(Continued from page 39)

ordinarily 50 to 70 feet long. The suction line was handled by a single-drum hoist belt-driven from the same Caterpillar RD8 engine which furnished power for the Fremont 8-inch centrifugal pump used for dredging. A Beebe hand winch was mounted on the floating platform for handling the anchor lines, and a Ramsey hand winch was used ashore. A five-man crew operated the dredge, which was dragged ashore, the power plant and pump transferred to trucks, and they, with the floating platform, moved to the next point of operation when the work was completed at one location. Rego valves controlled the welding gases fed to the Rego torch for repairs to pipe lines and pump.

Piles and Pile Driving

Piling had to be shipped long distances, coming from Tennessee, Texas, and Oregon, and was unloaded at railroad sidings at Barr, Isleta, and Los Lunas, by a job-built steel gin pole mounted on a Chevrolet truck with a power take-off to handle the cable. The piles were distributed to convenient stockpiles along the levee by an International truck with a trailer hauling loads of ten or twelve piles. From these stockpiles they were snaked to the pile drivers by teams and a Caterpillar D4. An old Caterpillar Sixty mounting a Tulsa winch was used in this work at times, as well as in other operations about the job.

Four separate outfits drove the piling in lengths of 32 to 40 feet, depending on the ground elevation, as all tops were driven to a uniform grade and a minimum penetration of 25 feet was specified. The line of the pile dike varied from almost the toe of the levee to 250 feet away from it. Piles were spaced at 10-foot intervals and on the double dike two lines were driven 10 feet apart with the piles opposite in each line. Tie-back lines with piles spaced at 10 feet were constructed at intervals of about 400 feet at right angles to the line of the dike.

One pile-driving outfit consisted of a Link-Belt Speeder Model 75 crane car-

rying 40-foot steel swinging leads and a Vulcan No. 3 steam hammer for which a 30-hp vertical boiler set on skids near the center of the section being driven supplied the steam through a 2-inch pipe line. A jet made of 4-inch well casing was used with this driver, and the water for jetting was taken directly from the river by a 6-inch centrifugal pump, delivering through a 4-inch line to the flexible jet connection. Clear water for the boilers was taken from the river-side drain ditches where available; where this was not feasible, a wellpoint was driven in a sand bar.

Two wooden skid rigs with 50-foot leads were also used at first, with 30-hp vertical boilers and 3-drum hoists integrally mounted. Both of these rigs swung Vulcan No. 2 hammers and at the time of our visit one of them was also using a jet of 4-inch well casing supplied by a Hercules-powered Fairbanks-Morse pump taking its water from the river through a 4-inch suction. However, because of the rough terrain, the skid rigs could not be moved from one

location to another without being completely torn down. As this and their reassembly required about five days, their use was abandoned and for the remainder of the job the contractor used two draglines for pile driving. Only two of the eleven dikes on this contract were driven with the skid rigs.

The fourth pile driver was a diesel-powered P & H crane with 40-foot steel leads carried on the 50-foot boom, with their bottoms braced to the cab frame by a horizontal steel framework. Steam for the Vulcan No. 3 hammer was supplied by an Oil City 40-hp horizontal boiler through a rather long 2-inch pipe line. This driver worked in rough and brushy territory and a Caterpillar RD6 tractor with a LeTourneau bulldozer cleared and leveled the terrain to improve its working path.

One 10-hour shift was standard practice although at times some of the operations were carried on for two shifts of 8 hours each. Production averaged from 30 to 35 piles per 10-hour day with a record day of 46 piles driven without

the use of a jet. All steam equipment was coal fired.

Placing Cable and Fencing

On the single-pile dike, second-hand cable, from $\frac{7}{8}$ inch to $1\frac{1}{2}$ inches in diameter and tested to 50 per cent of the strength of new cable of like size, was looped around the top of the piles to reinforce the individual piles against blows from drift as well as to support the fencing strung between the piles to break the force of the current and create a silt deposit behind the dike for additional bank protection. The cable was stretched by a Caterpillar D4 tractor from concrete-block deadmen through the levee and along the line of piles, one loop being made around each pile near its top. On the front or river-side row of the double-pile dike the cable was stretched at both the top and bottom of the section of the pile above ground while the back row of piles was reinforced by only the single cable at the top of the piles.

(Concluded on next page)

LOOK AT THESE SPEEDS!



THRU 3 FT. OF
HARD SNOW



WIDENING-
OUT



You clear more miles of snow per hour—open roads much faster—when powerful Walter Snow Fighters patrol your highway system.

These rugged units smash through road-blocking drifts—hurl snow far to the side—speed widening-out. They enable you to get snow cleared away before it packs and freezes into dangerous ruts. They gain you extra time for opening more miles of secondary roads, by clearing main highways faster. The Walter 250 H.P. Snow Fighter, for example, opens a 28 ft. width in ONE pass—clears a two-lane road in ONE round trip!

No other equipment can equal a Walter Snow Fighter in snow-removed-per-hour—because no other equipment has the unmatched power and traction provided by the exclusive Walter Four-Point Positive Drive. Three automatic locking differentials proportion the tremendous motor power to each of FOUR driving wheels according to their traction at any instant. There is no wheel-spinning, side-slipping or stalling to reduce speed.

For the complete story on Walter Snow Fighters, send for detailed literature.

WALTER MOTOR TRUCK CO., 1001-19 Irving Ave., Ridgewood 27, Queens, L. I., N. Y.



WALTER
SNOW FIGHTERS

CUMMER ASPHALT PLANTS

EIGHT SIZES

Up to 1000 Tons per day

DRYERS

Two-Fire and Internal
Fire

30 to 100 Tons per hour

Electric Batch Timers

50 Years' Experience

THE F. D. CUMMER & SON CO.

EAST 17th & EUCLID
CLEVELAND 15, OHIO

New Mexico Pile Dike Strengthens Old Levee

(Continued from preceding page)

Galvanized-wire fencing with mesh varying in size from 3 x 6 inches at the bottom to 6 x 8 inches at the top was stretched in 55-inch-width pieces along the front of the single-pile dike and the front row of the double-pile dike. Each wire of this fence was fastened to each pile by 1½-inch staples and the top wire was tied to the cable at 1-foot intervals. This fencing was set with the smaller mesh down and another 55-inch width was laid flat on the ground on the river side of the dike to prevent the river from cutting under the vertical fencing and destroying the silt bank. This horizontal mesh was fastened to the vertical fencing by two strands of No. 12 wire every 6 inches, and anchored on its outer edge by two strands of No. 9 wire, woven around alternate piles, through the horizontal fencing and into steel loops left in 1-foot square blocks of concrete, precast and buried 1 foot outside the edge of the fencing. All placing and tying of the fencing was done by hand by crews of ten to twenty men, depending on the availability of labor.

The front row of the double-pile dike is identical with the single-pile dike, except for the added cable at the ground line, while the back row of piles carries no fencing but only the top cable. Cross braces of 3 x 8 lumber were fastened to each pair, front and back row, of the double-pile dike by five spikes in each pile.

Quantities and Personnel

Major quantities involved in this contract for repairs to levees and protective works of the Middle Rio Grande Conservancy District included the following:

Fill	80,000 cu. yds.
Single-pile dike	16,400 lin. ft.
Single-pile tie-back	3,150 lin. ft.
Double-pile dike	2,940 lin. ft.
Rock groins	425 cu. yds.

The contract was awarded by the U. S. Engineer Office at Albuquerque, N. M., on February 14, 1944, to Staveland & Kendall of Kansas City, Mo., on the low bid of \$158,299.25. The completion date was April 28, 1944. Rex Stuart was Superintendent for the contractor, and the work was supervised for the U. S. Engineers by a Project Engineer, with a crew of inspectors and assistants.

Dewatering Excavations By Moretrench Systems

Over ninety types of construction where the Moretrench wellpoint system of removing water from foundations has been employed are described in a new 100-page catalog with nearly 200 illustrations and line drawings. Part One, which composes the larger part of the book, illustrates and describes a wide variety of dewatering jobs, including bridge foundations, flood-control structures, pier footings, river diversions, sewers, sewage-treatment plants and other types of heavy construction. Part Two deals with auxiliary equipment used in connection with the wellpoints,

such as pumps, couplings, et cetera, and also gives general information on sales, rentals and service available. The book is well indexed for quickly locating reference material on any particular kind of dewatering problem.

Copies of this comprehensive catalog of dewatering operations may be secured by writing to the Moretrench Corp., 90 West St., New York 6, N. Y. Just mention this review.

Euclids on the Move

A 24-page book, with stiff covers, describing and depicting Euclids on dirt-moving and construction jobs in many parts of the country, has just been published. The numerous excellent photographs show Euclids at work on airfields, highway relocations, flood-control dams and levees, and the accompanying text includes job descriptions. Empha-

sizing the versatility, speed and economy of this unit for a wide range of off-the-road jobs, this book will be interesting and helpful to users of earth-moving equipment.

Copies of "Bottom-Dump Euclids on the Move" are available for distribution upon request to the Euclid Road Machinery Co., Cleveland 17, Ohio, and mention of CONTRACTORS AND ENGINEERS MONTHLY.

LOOK AHEAD WHEN YOU BUY

Guaranteed performance is minimum performance for JAEGER "Sure Prime" PUMPS



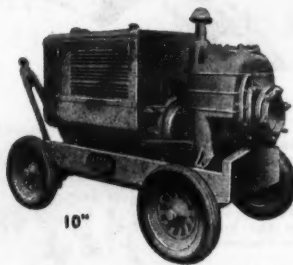
3000 Gallon "Bentam"

Contractors who watch their costs know there's a big difference between a Jaeger "Sure Prime" and an ordinary pump of the same size and rating. Jaeger Pumps are built to exceed their promises—deliver their rated capacity under tougher conditions, prime unfailingly and up to 5 times faster, assure you of thousands of extra hours of dependable cost-cutting service during the post-war building years ahead.

INDIVIDUALLY TESTED AND CERTIFIED for vacuum, capacity and pressure. Sizes 1½" to 10"; gas, electric or diesel power.



JAEGER DISTRIBUTORS in over 100 cities sell, rent and service "Sure Prime" Pumps.



LOOK AHEAD WHEN YOU PLAN

Jaeger's method of VIBRATION ON THE FINISHER will meet tomorrow's specifications...



Either Vibratory Tube or "Bullnose" Vibratory Screed



"Bullnose" front screed, equipped with vibratory motors, crowds material under, insures deep internal vibration of entire mass and maximum density of slab from form to form—the original and unfailingly successful Jaeger method. Compare this with mere surface vibration which, tests show, does not efficiently overcome porosity at base and sides.

Although Jaeger can furnish a vibratory attachment for use on Concrete Spreaders if desired, the recommended Jaeger method of vibration on the Finisher has proved superior for any true vibratory mix. On an efficiently run job, only the Finisher has time to go back for more than one vibratory pass, as often needed. Also, it is the machine which always finishes to form level, thus insuring an over-all vibrated surface. (No low spots to be filled with unvibrated material or high spots from which the vibrated surface may be torn as is possible when vibration is on the Spreader.)

To meet future specifications we recommend the Jaeger Vibratory Finisher with "bullnose" screed giving DEEP INTERNAL VIBRATION and maximum density from form to form, or, where conditions are suitable, the use of a Vibratory Tube on the Finisher.

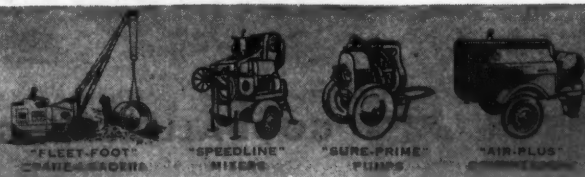
THE JAEGER MACHINE COMPANY

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JAEGER

Engineered EQUIPMENT

JAEGER-LAKEWOOD SPREADERS, FINISHERS AND BITUMINOUS PAVERS, FORMS, FORM TAMPERS—"DUAL-MIX" TRUCK MIXERS, AGITATORS—JAEGER HOISTING ENGINES, TOWERS



The Rud-o-Matic Tagline is operated on a spring principle and maintains at all times a positive tension sufficient to steady a clam shell bucket under any and all conditions, and will operate perfectly with the boom at any angle. It eliminates all the grief usually encountered with the average tagline as there are no weights, tracks, pins, carriages, or sheaves to wear out or to get out of order. Because of the large bearings and fewer sheaves, the saving on cable alone would eventually pay for it.

Tagline is complete with fair lead and cable attached and can be installed in less than one-half hour. Most of the crane manufacturers have adopted the Rud-o-Matic as standard equipment.

McCaffrey-Ruddock Tagline Corp.

2121 E. 25th St., Los Angeles 11

RUD-O-MATIC
foolproof
TAGLINES

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Rebuilt and Guaranteed

4—Model CS10A Continental 10 C.Y. Wagon Scrapers. 3 with pneumatic tires. 1 with tracks.

4—Model 5 M Euclid Two-Section self-cleaning sheepsfoot rollers.

E. J. ALBRECHT COMPANY

2426 West 26th Street
Chicago 8, Illinois



A 15-inch beam being bent in one of the new Thomas bending and straightening machines.

New Bending Machine For Structural Steel

Many shops of state highway departments, contractors, counties and the military services would have welcomed bending and straightening machines, in capacities ranging from 50 to 400 tons, for cold bending and straightening structural shapes and other metal forms during the war. Such a line in this range has been announced by Thomas Machine Mfg. Co., Butler Road, Pittsburgh 23, Pa., in six sizes available now for post-war service.

Beams, channels, rails, shaftings, rounds, squares, forgings, structural sections, or any metal sections that require bending or straightening can be handled by these machines. Weighing from 3,800 to 55,000 pounds, the machines can bend 5 to 24-inch beams.

Thomas bending and straightening machines eliminate the wasteful process of heating beams or shapes, staking them out on a bending table, and having work gangs hammer them to the desired shape. Since the work is performed cold, no furnace is required and one man easily handles the operation, according to the manufacturer. The machines are modernized throughout with important mechanical improvements, welded steel frames, and entirely enclosed operating machinery. A continuously running ram with one bending block, striking against the shape to be bent midway between two bearing blocks, represents the operating principle of the machines. The length of stroke of the ram is quickly adjustable by a convenient handwheel so located that the operator has unobstructed view of his work.

Other construction details and full information regarding the service, availability, and cost of these machines may be secured direct from the manufacturer whose Bulletin No. 315 describes the machines with illustrations and technical data.

Estimated Output Of Graders in 1945

In order to determine the actual 1945 capacity of the motor-grader industry, the Construction Machinery Division of the War Production Board recently called upon members of the Motor Grader Manufacturers Industry Advisory Committee for figures on their potential 1945 output, under present conditions of materials and component shortages. The Committee members indicated that they could produce 6,000 graders for 1945, under the conditions stated.

Mr. Hale of the Construction Machinery Division of WPB pointed out that such a production for 1945 represents a 50 per cent increase over the rate of the fourth quarter, 1944. He also mentioned the difficulties of drawing up a grader program in view of the demands of the truck program for 1945.

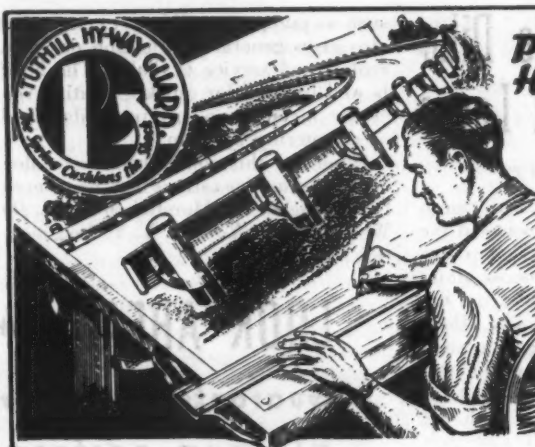
The Motor Grader Manufacturers Industry Advisory Committee consists of a representative from each of the following companies: W. A. Riddell Corp., Bucyrus, Ohio; the Galion Iron Works & Mfg. Co., Galion, Ohio; the Caterpillar Trac-

tor Co., Peoria, Ill.; J. D. Adams Mfg. Co., Indianapolis, Ind.; and the Austin-Western Co., of Aurora, Ill.

Mix-in-Travel Plant For Stabilized Base

The Madsen Road Pug, a single unit of road-building equipment which picks up base material, dry-mixes the aggregate, sprays bituminous binder into the aggregates, densifies the mixture for complete penetration of the oil, and discharges a uniform road-mix, is described in a new 12-page catalog. The manufacturer states that this plant produces a low-cost road-mix of high quality and uniformity, and claims a production capacity of 200 to 550 tons per hour.

Copies of Bulletin MP-120-6C, giving complete facts on the mechanical parts and construction of the Madsen Road Pug, its operation and uses, may be secured by interested highway engineers and contractors upon application to Madsen Iron Works, Huntington Park, Calif. Just mention this review.



Pacific Coast Manufacturers and Distributors

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Los Angeles, Calif.

TUTHILL SPRING COMPANY
762 POLK ST. CHICAGO 7 ILL.

Plan Tomorrow's Highway Today

and include in your Specifications—

TUTHILL HIGHWAY GUARD RAILS

TODAY leading Highway Engineers are drawing plans for Tomorrow's Highway and are including in their specifications TUTHILL HIGHWAY GUARD RAILS. Why? Because TUTHILL meets the exacting standards . . . of Safety . . . of Strength . . . of Low Installation and Maintenance Costs.

Why are TUTHILL Guard Rails safe, strong, easy to install and maintain? The design is the answer—concave surface, deflective action, and unusual visibility. (Available now for maintenance and repairs.)

Contractors' Hose... Backed By a Famous Name and Trademark!



Contractors learned long ago that using the name GOODALL as their buy-word for rubber hose assured maximum safety and efficiency in service, and the longest possible span between replacements. No matter what kind of hose the job requires . . . air, steam, water, suction, discharge . . . the Goodall Clover Leaf Trademark symbolizes the very best that selected materials, expert workmanship and modern manufacturing methods can produce.



WATER HOSE

Contractors know "Roadbuilders" for its splendid reputation on pavers, mixers and other heavy-duty equipment. For other services, "Buckskin" and "Bellwood" are equally well known for the long, low-cost service their use assures.

SUCTION and DISCHARGE HOSE

"Newtype Cord" is the finest hose available for this service. Tough, flexible, crush-resistant. Can be rounded into shape again if run over or otherwise distorted. Smooth bore withstands excessive abrasive wear.

AIR HOSE Goodall Air Hose is made in several types of moulded-and-braided and wrapped duck constructions, to meet every service requirement. "Subway," "Mine King," "Allgood Cord" and "Oil King" brands are leaders in the line. Some are all-synthetic.

STEAM HOSE "Inferno," "76" are old familiar names to users of steam hose. No matter what the service demands, the specifications to which Goodall steam hose is made will prove more than adequate for the required working pressures and temperatures.



GOODALL BELTING, BOOTS and CLOTHING

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Highway Construction Needed in Tennessee

Study of Highway System Indicates \$205,040,000 Of Improvements Required; Status of Planning

By C. W. PHILLIPS, Commissioner of Highways and Public Works for Tennessee and Regional Vice President of the American Association of State Highway Officials

SINCE its organization in 1916, the Tennessee Department of Highways and Public Works has expended \$300,000,000 on highways. Over half of this amount was spent prior to 1932 and represented about five or six dollars of state money to every dollar of Federal money spent. There are 7,524 miles in the state highway system, 56,430 miles of county roads maintained and controlled by the ninety-five counties throughout the state, and approximately 3,900 miles of city streets which are maintained by the various municipalities, with the exception of the state highways passing through such communities. The Federal-Aid system in Tennessee comprises 4,956 miles. Of the total car mileage carried on the 67,854 miles of highways and streets in the state, 46 per cent use the state highway system, 40 per cent use the city streets, and 14 per cent the county roads.

The importance of a nation-wide network of highways providing transportation facilities for the entire nation, without regard to state lines, is fully realized. The position of Tennessee in this system can best be understood by the fact that the Army Engineers designated 1,360 miles of the Federal system in Tennessee on the "strategic network". The Committee appointed by the President for the selection of an Interregional System of roads has selected 1,050 miles within Tennessee.

Road Needs Studied

To begin a study of the state highway system, we considered the different types of surfaces, the amount of traffic, and the connections of the state highway system from both a state and national standpoint. We further studied the expenditures, so as to make a complete analysis of our state system in regard to traffic service, traffic costs, and the development of the system to what we consider present-day standards.

The first construction or first improvements on the highways of Tennessee will be spread over a major portion of the main or arterial roads in the state. Built 15 to 20 years ago, these roads are not up to the standards of today, for the reason that neither the automobile nor the truck of that time demanded the type of roads which the car or heavily loaded truck of today demands. The automobile, in its requirements for safety and convenience of the traveling public, has naturally kept ahead of highway development; that is, cars could use advantageously and economically faster, wider and better highways than had been built before the past few years. Therefore it

is plain that roads built several years ago are in some state of obsolescence for the automobile of today or the one to be put into service in the future.

Our survey indicated that to bring the Tennessee highway system up-to-date, or up to standards considered satisfactory at the outbreak of the war, would cost \$205,040,000, exclusive of any right-of-way cost. In order to study the needs more carefully, this total was broken down into two categories: work needed on the regular Federal-Aid system, both rural and urban; and off the Federal-Aid system, both rural and urban. Of the total money needed, \$135,645,000 is for new construction, reconstruction, and bridges on the Federal-Aid system, both rural and urban, and \$69,395,000 for work off the Federal-Aid system,

both rural and urban.

Needed Improvements

In setting up the estimate, we found that under "New Construction" we have 294 miles of new grade upon which it is necessary to construct a high-type surface costing \$10,290,000. We have 2,590 miles of complete new location, grading, drainage, and surface, costing \$116,858,000. We also found that, under "New Construction", there are 103 miles of urban highways or streets which will have to be completely constructed, including grade, drainage, sidewalks, pavements, etc. This will cost \$20,097,000.

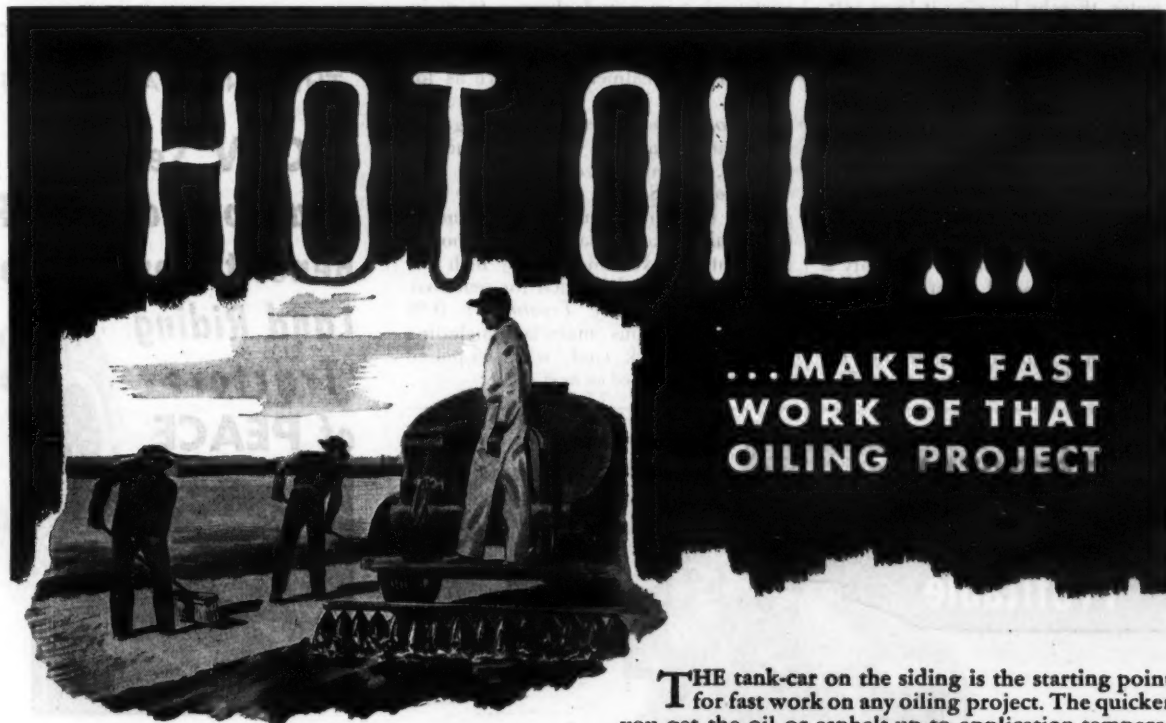
Under "Reconstruction", we have 950 miles of widening grade, surfacing or resurfacing, culverts, etc., costing \$14,250,000. There are 665 miles with surfaces to be reconstructed or strengthened to carry the additional heavy traffic which was not contemplated when the roads were originally designed and built. It is estimated that this work will cost \$5,750,000. In this category, there

are also 100 miles of urban highways or streets to be improved at a cost of \$5,500,000, which covers replacing or re-vamping the surface only.

In the total of 1,232 bridges estimated to cost \$32,295,000, there are 632 structures to be widened, at an estimated cost of \$6,420,000, to meet present-day needs; and 600 new bridges to be constructed, costing \$25,875,000. These 1,232 structures constitute the construction or reconstruction of 20½ miles of bridges.

We have not attempted to include the cost of construction of the Interregional System in this estimate. If this system is adopted and is constructed to the standards set out in the report, Tennessee will need an additional \$108,000,000 for that work, exclusive of any right-of-way cost. There is no question about the feasibility, practicability, and the necessity for express highways throughout the United States, and Tennessee joins in recommending this system, insofar as its finances will permit. However, we do

(Concluded on page 85)



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FAST—WITH LESS
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WATER**



Not just a "boiler on wheels" but a rugged, compact, highly perfected steam generator built by specialists in steam generating equipment.

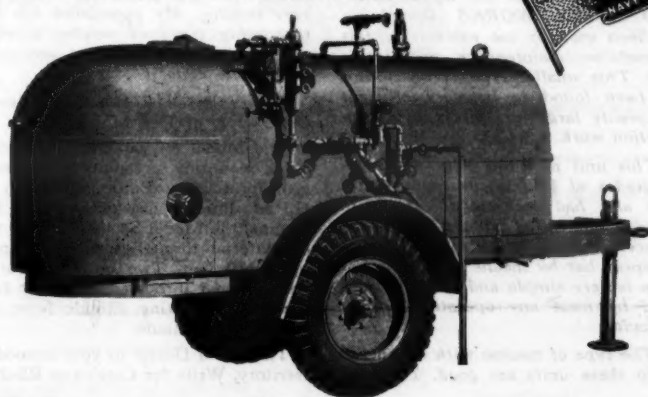
The only tank-car heater with the fuel-saving four-pass flue travel construction. No water problem — full condensate recovery and return to heater under pressure.

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THE tank-car on the siding is the starting point for fast work on any oiling project. The quicker you get the oil or asphalt up to application temperatures and flowing into the distributors — the faster your road crews can get going.

With a Cleaver-Brooks tank-car heater you have hot dry steam flowing to the car coils from a cold start in 20 minutes or less. And you can keep going all day with the least work and bother because a Cleaver-Brooks tank-car heater asks less in fuel and water. The famous and exclusive four-pass flue travel means low fuel consumption; the turbine type condensate return system cuts water loss — every drop of condensate goes back to the heater under pressure. ... Built for full capacity — full-time work — Cleaver-Brooks tank-car heaters will give you the most in production hours on the job. Wherever in service, Cleaver-Brooks are usually given the tough jobs because of their known reliability. ... Write today — get full information from Cleaver-Brooks — the pioneers and originators of tank-car heaters and bituminous boosters.

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Jacks

for every construction purpose
Awarded the Gold Medal for Safety
Ask for Catalog 44

Templeton, Kenly & Co., Chicago 44, Ill.

Sealing and Surfacing Heavy-Haul Highways

(Continued from page 43)

square yard, followed by an application of aggregate of $\frac{1}{4}$ -inch maximum size at the rate of 5 or 6 pounds per square yard. The bituminous material is applied either by a hand spray or by a distributor, the method depending upon the extent of the area to be treated.

By careful inspection and consistent spot-sealing, we are able to reduce very materially patching costs and surface deterioration. This spot-sealing work is not confined to the spring, summer and autumn seasons, but is carried on all through the winter with excellent results, because even though there is moisture present in the cracks, as long as the uncracked areas are reasonably dry, the treatment is effective. The application of this light seal accomplishes two important results: (1) It seals out the surface water, thereby keeping it from softening the subgrade; (2) It livens up the old bituminous surface, accentuating its ductility and binding quality. This spot-sealing of bituminous surfaces is considered the most important item in the maintenance of bituminous highways in West Virginia.

Types of Maintenance Work

On projects where there is, as a whole, a lack of adequate stability, we apply a strengthening course of from 100 to 200 pounds per square yard over the entire project, using preferably the penetration method with 85 to 100-penetration asphalt binder. This penetration-macadam

strengthening course has much more inherent stability than any other type of bituminous surface.

A dragged treatment of at least 55 pounds per square yard is necessary on top of the penetration-macadam leveling course in order to provide a smooth riding surface. In cases where only short sections are unstable, strengthening sections are applied at intervals as needed, and then when necessary the entire project is sealed.

On projects where the bituminous pavement has sufficient stability but there is evidence of surface deterioration such as raveling, checking or alligatoring, dryness from lack of or oxidizing of the bitumen, and other surface defects, we apply a 10-pound seal treatment or a 25-pound surface treatment, the weight of the treatment depending upon the extent of the deterioration. In some instances, where the existing surface is very uneven, the surface treatment is increased to 55 or to 90 pounds, to aid in leveling or smoothing and thus provide a better riding surface, as we have found by experience that a smooth surface is easier and cheaper to maintain.

The rates of application for the seal and surface treatments used are as follows:

10-Pound Seal Treatment: 0.2 gallon bituminous material with 10-pound aggregate, maximum size $\frac{1}{4}$ inch.

25-Pound Surface Treatment: 0.45 gallon bituminous material, including 0.15 gallon tack coat, with 25-pound aggregate, maximum size $\frac{1}{2}$ inch for binder course and $\frac{1}{4}$ inch for seal coat.

55-Pound Surface Treatment: 0.90 gallon bituminous material, including 0.15 gallon tack coat, with 55-pound aggregate, maximum size $\frac{3}{4}$ inch.

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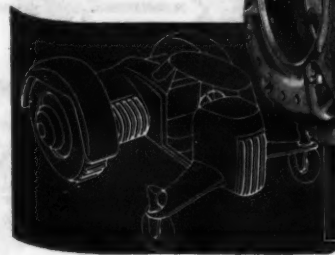
Loads of Rock Over Roads of Rock



LINN HAFTRAKS, with Contour-following Traction, move 8 yard loads of asbestos rock over 25 per cent grades.

THE LINN MANUFACTURING CORP. Morris, N. Y.

HOW Sea Going Tractors of WAR Benefit Designs for Land Riding Tractors of PEACE



Built to blast their way over shell torn hills and through reefrimmed seas, Buffalo tractors have inspired surer footed designs for post-war tractors. And the rugged service demanded of the clutches in these pitching, plunging Buffaloes has developed battle-proved types of clutches that will make peacetime tractors better able to overcome the toughest going.

ROCKFORD OVER CENTER and SPRING-LOADED CLUTCHES and POWER TAKE-OFFS

Let our engineers show you how the war-inspired improvements in ROCKFORD CLUTCHES and POWER TAKE-OFFS can be utilized to benefit your new and redesigned models. They will be glad to suggest practical solutions to your power transmission problems.

SEND FOR THIS HANDY BULLETIN ON POWER TRANSMISSION

It shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications. Every production engineer will find help in this handy bulletin, when planning post-war products.



Rockford Drilling Machine Division

Borg-Warner Corporation

314 Catherine Street, Rockford, Illinois, U. S. A.



Pullmore Multiple-Disc Clutches • Over-Center and Spring-Loaded Clutches • Power Take-Offs

Finds Blacktop Maintenance Profitable

with This \$1200 Distributor

"— my SJ STANDARD STEEL WORKS Distributor has been used by me extensively this summer on maintenance and repair work. This smaller type of distributor has been found to be very efficient and plenty large for this type of construction work.

"This unit performs very well with all grades of bituminous materials. I have also had occasion to use it in applying emulsified asphalt to the road surface. The regulation of pressure to the spray bar by means of the by-pass valve is very simple and is easily mastered by most any operator, without difficulty.

"The type of torches with which you equip these units are good. They are

free from clogging and will heat a load very rapidly. My experience has been that other types of torches often go out, due to scale and rust accumulating in the coils."

Thus writes V. C. Benderoff, General Contractor, of Des Moines, Iowa.

The Model SJ can be furnished for truck mounting, or on its own running gear for towing. Equipped with a 100 G.P.M. Pump, powered by a 15 H.P. Engine, the Model SJ handles any type of material through spray bar lengths up to 10 feet. Two powerful burners pouring heat through 5-inch heat tubes assure fast heating. Single lever controls all operations.

There is a Dealer in your immediate territory. Write for Catalogue RS-2142.

OTHER PRODUCTS

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Do Your Part—Keep On Buying Bonds
DON'T SKIMP

Types of Maintenance On W. Va. Highways

(Continued from preceding page)

aggregate, maximum size 1/2 inch for binder course and 3/4 inch for seal coat. 90-Pound Surface Treatment: 1.15 gallons bituminous material, including 0.15 gallon tack coat, with 90-pound aggregate, maximum size 3/4 inch for binder course and 1/2 inch for seal coat. We prefer tar for the 10-pound seal treatments; tar or asphalt emulsion for the 25-pound treatment; tar, asphalt emulsion, or cut-back asphalt for the 55 and 90-pound treatments; and asphalt emulsion or 85 to 100-penetration asphalt for the penetration-macadam surfaces. For bituminous concrete, either 85 to 100-penetration asphalt or RT-12 tar is used for the hot-mix material.

Traffic-Bound Surfaces

In the maintenance of traffic-bound surfaces, such as gravel, crushed-stone and slag-surfaced roads, we have reduced costs by concentrating on surface consolidation, using from 2 to 3 pounds of calcium chloride per square yard. The surface is first bladed and shaped, giving it a crown of 1/2 to 3/4 inch per foot. The calcium chloride is then spread in increments of from 0.5 pound to 1.0 pound per square yard. These applications of calcium chloride eliminate the dust nuisance, reduce blading costs, and preserve a smooth riding surface. The calcium chloride also to some extent reduces the damaging effect of frost action below the surface.

Bridge Maintenance

The maintenance of all bridges is done by state forces. There are in West Virginia approximately 4,521 bridges of all types, other than wooden bridges, with span lengths averaging 95 feet, and 2,908 bridges of all types, other than wooden, with span lengths of less than 20 feet. In addition, there are approximately 5,000 mostly small wooden bridges.

The maintenance of steel bridges consists of minor steel repairs and painting. Prior to the war, when a bridge began to show signs of rust, the entire structure was painted with a coat of aluminum paint. During the war, this work has been curtailed to spot painting and, in instances where a major portion of the structure was badly in need of painting, we have applied one coat of red lead only, as aluminum has been one of the materials on the critical list. To date we have been able to obtain sufficient red lead to keep rusted spots painted and thereby preserve the steel. Steel members salvaged from abandoned steel bridges have been used to good advantage in building, repairing, and replacing small bridges. We have also used old street-car rails in lieu of I-beams in our bridge work.

The maintenance of concrete bridges is ordinarily a minor item and consists for the most part of patching or reintegrating broken or deteriorated areas,

and repair work of this type has been held to an absolute minimum. Only work conducive to the safety of the bridges has been undertaken.

The maintenance of wooden bridges consists of replacing stringers and floors, and a great deal of this replacement work is necessary every year.

Personnel

The personnel of the Maintenance Division of the State Road Commission of West Virginia consists of a State Maintenance Engineer; ten District Engineers; a District Maintenance Engineer and a Junior Engineer in charge of two or more counties in each District; and a

County Maintenance Superintendent in each of the fifty-five counties in the state.

All of the highways in the state, totaling 33,063 miles, are under the jurisdiction of the State Road Commission, which is also responsible for the maintenance of the primary routes through all municipalities.

7 YEARS WITHOUT A BREAKDOWN OR MACHINE REPAIR



Mr. George W. Brown, Town Superintendent, Walworth, New York.

Dear Mr. Brown:

Just a few lines to thank you for writing.

It is gratifying to note that you have yet to buy your first actual repair parts for your General Excavator, particularly since this machine was shipped more than 7 years ago. Most folks would expect that a machine of that age, and with the service it has given, would be pretty well worn out - or would have required thousands of dollars in repair expenditures.

In all modesty, Mr. Brown, we do take pride in the way Generals can "dish it out" and "take it," and here's hoping you continue to have the best of luck with your machine. Here too, incidentally, is our promise that after the war, Generals will be better than ever!

Cordially,

THE GENERAL EXCAVATOR COMPANY,
Don B. Smith, Sales Manager

DBS/fb

AND WATCH

The General "Type 10"

the revolutionary Machine of Tomorrow, when the swing is to postwar business. Crane-shovel-dragline all in one, this advanced design rubber-tired, one-man, one-engine rig will give you a new lease on profit opportunities in your territory. Write for details today!

THE OSGOOD COMPANY
SHOVELS, DRAGLINES
CRANES
CRAWLER & WHEEL MOUNTS
DIESEL, OIL, GAS, ELECTRIC

Associated with The Osgood Company

GENERAL
EXCAVATOR CO.
MARION, OHIO

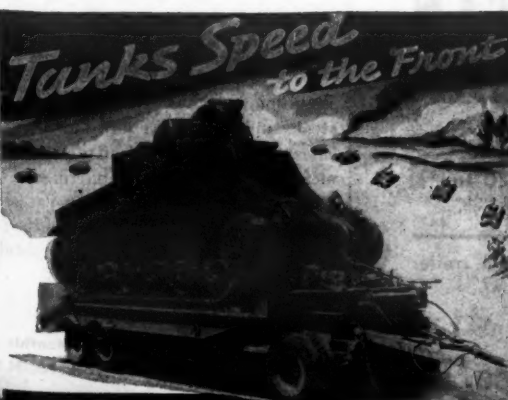
GENERAL
CRANES, DRAGLINES
AND SHOVELS
DIESEL, GAS, ELECTRIC

Behind this letter is the all-out performance of a General Excavator which has been in all-around municipal service since 1937... With the first repair part yet to be purchased! Here is strong basis for including GENERAL-built equipment in YOUR postwar plans.



GEORGE W. BROWN
Town Superintendent
Walworth, N. Y.

"...during national emergency I've personally operated and cared for this General Excavator... surprised to find so rugged a machine so easy to handle and keep adjusted... in addition to loading bank-run gravel, we use it on tough highway widening jobs - uprooting trees, breaking hard-pan rock... yet to encounter job too tough for The General."



Tanks Speed to the Front on ROGERS TRAILERS

GETTING there "fastest with the mostest" as one early American General aptly phrased it, is battle strategy that really conquers!

In the lightning speed of mechanized warfare tanks ride "Pick-A-Back" to battle on ROGERS TRAILERS so their fighting capacity is unimpaired. Special ROGERS TRAILERS retrieve disabled tanks so they can be repaired and rushed into battle again.

EXPERIENCE
Builds new
PERFORMANCE
Sells 'em

ROGERS TRAILERS are doing a real war job at home and abroad. New models which will be available to industry when war contracts are completed will be even better-engineered and more efficient than their predecessors.

ROGERS BROS. CORPORATION
ALBION,
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Change of Address

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From _____
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Name _____
Firm _____
Position _____

Battle with Winter Is Tough in Montana

(Continued from page 23)

connections are maintained with headquarters, and roadside signs indicate the locations and distances to these houses. The section men at these stations are on duty 24 hours a day through the snow season and often are obliged to work many of the 24.

Plan of Operation

In Montana the snow plows start work at the beginning of a snowfall. Operating on the theory that it is easier to keep a road open than to open a blocked one, the force starts early and stays long. The man-power shortage during the past winter was most acute, as about 35 per cent of the normal experienced force, including some key men, had gone to the armed forces or war jobs. Due to the same man-power shortage during the summer repair season, as well as the difficulty in securing parts or new equipment, Montana's snow fleet will be in worse condition this coming winter than ever before but it is still expected that the roads will be opened.

The heavily-timbered western part of the state presents less difficulty than the more open eastern section, but with a snowfall of 154 inches there are troubles everywhere at times. The primary roads have first priority and, when it is impossible to keep all roads open, equipment is temporarily removed from the routes carrying the least traffic and concentrated on more important highways. In exceptional cases in the past, some secondary roads have remained closed for periods of as much as ten days, but a real effort is made to avoid such inconvenience. When roads are necessarily closed, the public is notified by press and radio of the conditions, and travel is discouraged. The condition of the closed road is also indicated by signs placed at proper locations to warn the traveler.

The light, fast plows are out first but are supported by the heavier V-plows and wings to keep the snow back from the road surface. Rotary plows also go into action, handling the snow in the sections where the road cannot be kept clear without them, or opening the deeper drifts which stop the blade-type plows.

Due to the heavy grades on many of Montana's roads, particularly in the sections where the snow problem may be greatest, it is deemed advisable to run almost all snow-plowing trucks with tire chains on the driving wheels. Retreaded and recapped tires have been found to be fairly satisfactory on slower-moving, large-size units but have not worked so well for the faster, lighter ones. Montana expects to use this type of tire only so long as its use will further the war effort.

Snow Fences

In Montana the placing of snow fence

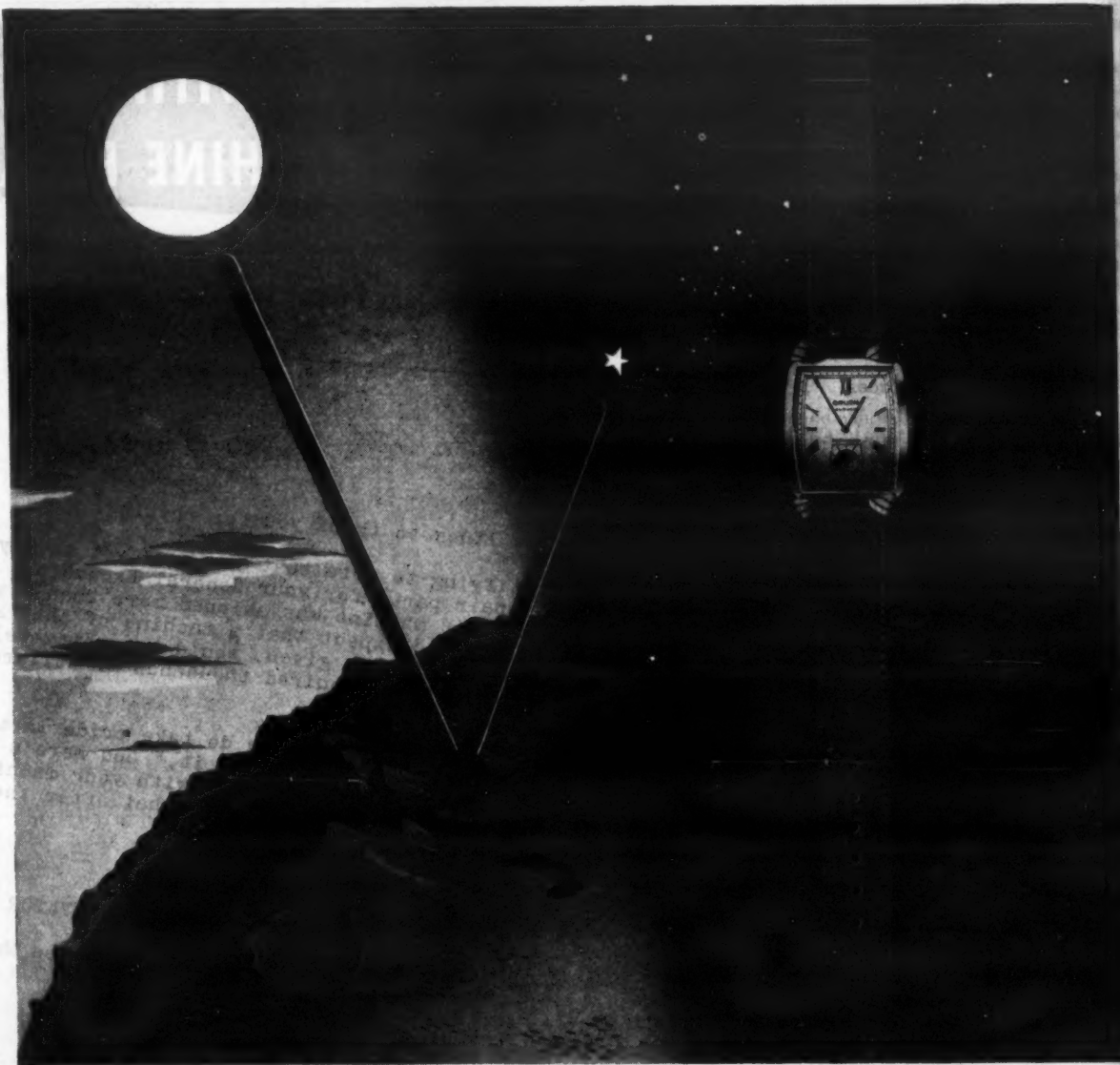
for maximum protection is not as easily done as in the plains states further east. Unpredictable air currents are set up in the mountains and these follow no established pattern nor do they always repeat. A snow fence which has been effective for years in a certain location

may be of no value in some storms.

The vertical-lath type of fence is favored in Montana but it is often erected in double heights, at varied distances from the road and at various angles to the center line. Fences are usually set with their bottoms almost level with the

ground surface although in some locations it has been found advantageous to raise them 6 to 8 inches above the ground. Fence is not ordinarily moved in the summer except when in need of repair or in cultivated areas.

(Concluded on next page)



The Watch that aimed at the Stars

Strictly speaking, precision time is the time of the stars. No watch in the world can match its perfection.

Gruen has tried to come as close to it as is humanly possible. In fact, Gruen is the one watch permitted to carry the trademark "Precision."

Behind this trademark lie 70 years of skill and craftsmanship...

Behind it are revolutionary new departures in design like the famous patented Gruen Curvex... a watch so daring, so different it is actually protected by a patent until 1959!

If you want a watch that gives you the utmost in precision, along with the very latest in style, be sure to see the new Gruen Watches. Ask your Gruen jeweler for the patented Gruen Curvex or the equally famous patented Gruen Veri-Thin.

While we have been manufacturing large quantities of vital precision instruments for war, we also continue to produce fine Gruen Watches for civilian use... but of course the demand for these watches far exceeds production possibilities today.

Illustrated above — Curvex Collegian, 17-jewel Precision movement, pink or yellow gold-filled case (Federal Tax included) \$55.00

THE PRECISION WATCH

Gruen Watches from \$29.75 to \$250; with precious stones to \$4,000. The Gruen Watch Company, Time Hill, Cincinnati, Ohio, U.S.A. In Canada: Toronto, Ont.

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THE PRECISION WATCH

BUY A GRUEN WATCH... BUT BUY A WAR BOND FIRST

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—4 models—
7, 10, 15 & 20-ton capacities

Don't say, "We want a TRAILER." Say: "We want a MARTIN Trailer."—This will insure your getting a trailer that's EASY LOADING, POWERFUL, FAST, SAFE, LONG-WEARING and ECONOMICAL....

Sold by all Caterpillar Distributors.

WRITE FOR BOOKLET

Martin Machine Company, Kewanee, Ill.

SALESMAN WANTED

Well-known manufacturer of tool steels and tractor repair parts wants salesman to call on contractors, municipalities, highway departments, as well as industrial plants. Liberal commission and wonderful opportunity for the right man. Please give full details and territory covered.

Address Box 253

Contractors and Engineers Monthly
470 Fourth Avenue, New York 16, N.Y.

Montana Organizes To Lick Ice Hazard

(Continued from preceding page)

where the land is required for agricultural use.

Along exposed stretches of road in open country subject to blinding blizzards, the road edges are marked in the early autumn by 4-foot stakes carrying a red flag. These flagged stakes are set at intervals of 100 feet on both sides of the road, with the spacing alternated on the two shoulders. This flagging has proved very helpful to the traveling public as well as the snow-plow operators.

Sanding

Sanding operations constitute a large part of the expense of wintertime maintenance in Montana. In the early autumn and spring, sanding costs more than snow removal, while even in the coldest months it is a major item of expense.

Sand is usually stocked in the summer and fall in storage houses constructed near critical locations, or in stockpiles if houses are not available. It has been found unnecessary to treat the sand stored in houses to prevent freezing, while that put in stockpiles has approximately 50 pounds of calcium chloride added to each ton of sand. The dry calcium chloride is dumped on the surface of the sand after loading in the truck and sufficient mixing is secured when these loads are dumped into the stockpiles.

Sand storage houses are constructed in sidehill locations where a gravity-feed system may be secured. A truck road is built to the higher side so that sand dumped into the house from the hauling trucks may flow by gravity to hoppers in the lower sections of the house which discharge into a truck at highway level. These sand houses are used principally near the higher mountain passes, are of double-wall lumber construction, and are painted the standard orange used on Highway Department equipment. Some, however, along roads in the national forests are of log construction more in keeping with their surroundings.

The Montana Highway Commission uses eight Butler sand spreaders and eleven of its own design, but in most cases spreading by hand is preferred. In sections of the state more accessible to the railroad, protection from the ice hazard is furnished by cinders, which are delivered by rail in carload lots to convenient locations. The abrasives are hauled by state forces to storage piles or directly to the point of use. It has been found unnecessary to use frost protection with cinders.

Costs and Personnel

Snow-removal costs vary widely in different districts as well as with the severity of the winter. The mileage of the state highway system has mounted steadily, which has of course increased snow-removal costs. In the winter of 1930-31, with 2,820 miles in the system, the cost of all snow-removal and sand-

ing operations was \$24,325. In 1932-33 the mileage had risen to 3,553 while the cost was \$53,100. An extremely open winter the next year lowered the cost on 3,981 miles to \$14,000. Since that time there has been an almost uniform increase in both mileage and costs until in the winter of 1942-43, \$251,100 was spent on snow removal and ice control on 5,240 miles of highway system.

The Montana Highway Commission, headed by Howard Holmes as State Highway Engineer, performs all snow-removal operations with its own forces. Ray Percy, Maintenance and Construction Engineer, has direct charge of the operations and is assisted by a staff of ten district engineers.

Diesel Dump Trucks With Bigger Brakes

Design and engineering to meet the exacting individual requirements of contractors are the features of the trucks built by Kenworth Motor Truck Corp.,

1263 Mercer St., Seattle, Wash. Practically every big dirt-hauling job presents a new problem for the operator, with some work requiring large trucks with an emphasis on power and payload while other work demands smaller units, but all must be sturdy enough to give uninterrupted low-cost service on the job. To meet this need, Kenworth has built balanced units of rugged construction and adaptability which have seen hard service throughout the eleven western states, Canada and the Hawaiian Islands.

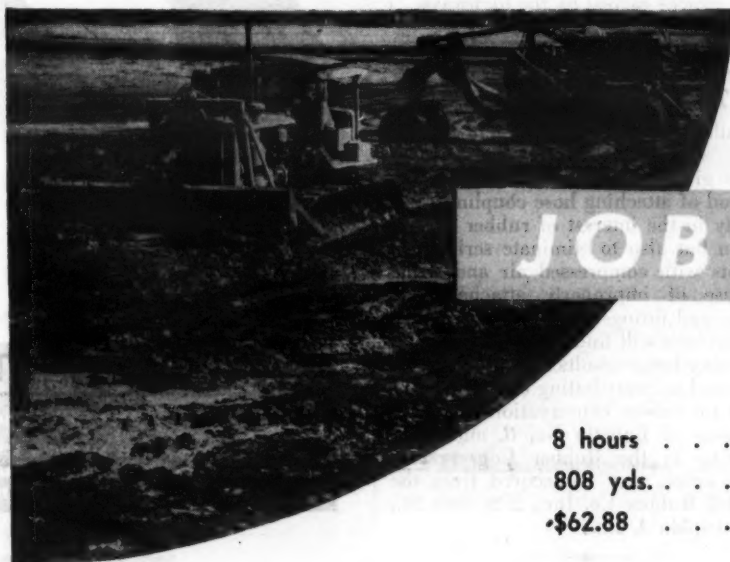
In designing Kenworth motor trucks, three factors are considered: first, the specifications and requirements of the individual operating the unit; second, the conditions under which the unit must operate; and third, the length, weight, and payload restrictions governing the territory in which the vehicle is to operate. To meet these factors, Kenworth offers its customers a choice of engines, drives, transmissions, axles, brakes, chassis and body styles of sound proved construction. A special feature of Ken-

worth trucks is the bigger more effective brakes used on both rear and front axles.

Motor-truck users in Kenworth territory should write direct to this manufacturer for further information, stating their problems, and mentioning this item.

Q. H. Witt Promoted

The promotion of Q. H. Witt, formerly connected with the general contracting firm of Booth & Flinn of Pittsburgh, Pa., to the rank of Captain of the Quartermaster Corps has been announced. Captain Witt, a native of Pittsburgh, began his Army career in June, 1941, with the Engineering Corps at Fort Belvoir, Va. Late in 1943 he was transferred to the Quartermaster Corps, attended Officer's Candidate School at Camp Lee, Va., and was commissioned a Second Lieutenant in December, 1943. At present, Captain Witt is assigned to the Depot Facilities Branch of the Storage and Distribution Division, Office of the Quartermaster General, Washington.



JOB DOWN!

8 hours . . . or . . . 11 days?
808 yds. . . . or . . . 8888 yds?
\$62.88 . . . or . . . \$691.68?

When a vital part snaps and the job is stalled you begin to do some real figuring. Suppose you were renting a tractor, bulldozer and scraper and there was a 1000 foot haul, the bulldozer being used as a pusher serving the scraper.

If you had to send to the factory for the new part you'd be 11 days behind, still have 8888 yds. of dirt to move and be out \$691.68 plus the cost of the new part and your normal profit on the job.

But

—because you find an A. E. D. member near your job—he has the part, or the men and equipment to make and install the part, it only cost you 8 hrs. delay—808 yds. and \$62.88 in lost rental and operator's time.

There are more than 500 A. E. D. members ready to save you dangerous delays on that rush war-time job. As neighbors of yours they do double duty—First to save you money and time—second to bring the manufacturers' full service to your doorstep.

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A.E.D. members.

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SAND'S Aluminum Line & Surface LEVEL



Endorsed and Adopted by Road
Builders and Contractors

Level is easily and quickly attached to line. Special feature construction prevents accidental detachment from line. Construction is sturdy, and accuracy guaranteed.

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LOOK FOR THE A. E. D. INSIGNIA - THE SYMBOL OF GOOD SERVICE

FOR VICTORY — AND MY PERSONAL POST WAR WORLD



IM FOLLOWING THE 7-KEY PLAN TO HOLD PRICES DOWN

1. Buy and hold War Bonds.
2. Pay willingly our share of taxes.
3. Provide adequate life insurance and savings for our future.
4. Refuse our share as much as possible.
5. Buy only what we need and make what we have last longer.
6. Follow ration rules and price ceilings.
7. Cooperate with our Government's wage stabilization program.

Hobart Issues Chart Of Welding Symbols

In order to clarify the designer's instructions to the welding shop, and to eliminate costly and dangerous errors in transmitting such information, a new kind of welding chart has been made available for distribution by Hobart Bros. Co., Troy 1, Ohio, maker of arc welding equipment. This chart illustrates the basic characters of welding symbols recommended as American Standard by the American Welding Society. Symbols for fusion welding, resistance welding, and for a combination of both are given separately, and since the location of the symbols, numerical and other data on the reference line has a definite significance, an illustration is included showing the standard manner of placing proper information on the symbols. Below the symbols, twenty-three typical welded joints and sections, covering butt welds, lap welds, tee welds, corner welds and edge welds are illustrated and marked with the standard welding symbols applying to that particular joint or section.

Copies of the chart, which is printed in three colors on heavy paper suitable for hanging on the wall of the drafting room or welding booth, will be supplied without charge to designers, inspectors, welding operators and others concerned with welding fabrication upon application to the company and mention of this item.

Road Taxes Exceed Federal Highway Aid

The Federal government receives from the motorists of this country as highway-user taxes more than \$500,000,000 a year. By the end of 1944, motorists will have paid in a total of \$5,500,000,000 in Federal highway-user levies and have received back in the form of Federal highway aid only \$3,391,000,000. Road users, therefore, have a "credit" with the Federal government of considerably more than \$2,000,000,000. Large Federal-Aid highway appropriations for urgently needed road construction in the post-war period will not be subsidies, but will be a just and proper usage of funds already paid in, points out Charles M. Upham, Engineer-Director of the American Road Builders' Association.

Highway construction resulting from Federal Aid has been more than self-liquidating. Highways that stimulate travel and make it less costly produce earnings. No other type of financial assistance given to state or local governments can show anything like the direct cash returns earned by the highways.

Use Couplings Properly To Conserve Rubber Hose

Bulletin No. 6 in the Goodall Rubber Co.'s series of Rubber Conservation Facts gives seven rules for the proper method of attaching hose couplings, primarily in the interest of rubber conservation but also to eliminate serious accidents with compressed air and steam because of improperly attached couplings and fittings. Users of all types of rubber hose will find these rules helpful in getting better results from their equipment and in contributing to the national effort for rubber conservation.

Copies of Bulletin No. 6, and other bulletins in the Rubber Conservation Facts series, may be secured from the Goodall Rubber Co. Inc., 2 S. 36th St., Philadelphia 4, Pa.

New Hyster Branch Mgr.

Donald Foster has been appointed Manager of the Chicago branch of the Hyster Co., of Portland, Ore., with offices at 221 No. LaSalle St. Mr. Foster has been with the Hyster Co. for several years. He succeeds C. C. Dunham who now becomes Personnel Manager of the Hyster factory in Portland.

WELLMAN WILLIAMS TYPE BUCKETS

BUCKET QUALITY BACKED BY TWO FAMOUS NAMES

Williams Buckets have been famous for nearly 40 years for their many mechanical features. Since 1931, Williams Buckets have been built by Wellman, known for many great engineering achievements in the heavy iron-ore, coal, and steel industries. The welded construction which featured Wellman custom-built buckets for extra heavy steel mill service, is now used in all

Wellman-Williams Buckets Built in Multiple Rope, Power Arm, and Power Wheel Types in ½ yd. to 16½ yd. capacities.

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Send for free Bulletin
Tell us about your particular requirement and we will send full description of construction and features in special bulletins which clearly prove why YOUR NEXT BUCKET SHOULD BE A WELLMAN.

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APPLIED LONG LASTING PROMPT DELIVERY

Here is a simple, inexpensive way to secure added life from sprocket and idler rims! Before the hub is too badly worn, replace the rim only with long-wearing PACIFIC Manganese Steel Renewable Tractor Rims for Caterpillar Tractors.—They are easily welded to old hubs, and are extremely tough and abrasion-resistant, thus providing long, low-cost, trouble-free service.—Write today for PACIFIC Tractor Rim Bulletin.

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Manufacturers of PACIFIC SLUSHING SCRAPERS & SHEAVE BLOCKS • PACIFIC CRUSHING & SCREENING UNITS • PACIFIC ROCK BIT GRINDERS • PACIFIC ALLOY-MANGANESE MILL LINERS & CRUSHER JAWS • PACIFIC TRACTOR RIMS, CRAWLER SHOES & Wearing Parts

JACKSON FLEXIBLE SHAFT VIBRATORS

... are the choice of those who want JACKSON standards of quality, dependability and performance. No other flexible shaft vibrator can offer such assurance.

Supplied with a 2" and a 1½" head. These two heads give user a vibrator efficient in and suitable for a wide range of applications. For instance, from wall sections of comparatively large size to narrow sections.

Model FS-6A, illustrated above, is furnished complete with 7, 14, 21 or 28 feet of shaft. Has dirt-proof turntable base. Supplied with or without wheelbarrow mounting.

Write, wire or telephone for further information

ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON, MICHIGAN

FIGHT WASTE!

USE LESS ★ ★ ★ ★ ★ So Our Fighting

Forces Will Have More

Resurfacing Program On Illinois Highways

(Continued from page 53)

where necessary, and resurfacing on the majority of projects are done under traffic. This practice has become more important since the beginning of gas rationing because a long detour would require the needless waste of large quantities of gasoline, and the loss in rubber might be considered even more serious by many. Ordinary traffic does not cause any particular difficulty with resurfacing operations. Even the application of the prime coat can be accomplished without much trouble. The only detours maintained on resurfacing projects are near large centers of population where traffic is unusually heavy, and in these locations detours can always be provided over good pavements with little difference in the length of travel.

The binder course is placed as soon as the prime has cured and pavement irregularities have been corrected with leveling binder. Usually enough binder is laid so that the plant will be able to operate for a full day on surface course. The average amount of binder mixture placed varies between 160 and 170 pounds for each square yard, depending on the condition of the old pavement.

In 1941 a full-width finishing machine operating on steel side forms was required on bituminous resurfacing projects. The cost of operation, as well as the time required to set the forms, made this type of construction rather impractical. Also it was impossible to maintain traffic on a two-lane highway during construction operations. In 1942 finishing machines without the use of side forms were specified and this has

proved very satisfactory. These machines place the bituminous material on one traffic lane at a time, which is most advantageous where the work is being done under traffic. They automatically correct minor surface irregularities in the old pavements. With the two-course construction some very smooth resurfacing has been obtained with these machines.

Either a three-wheel or tandem roller is permitted for the initial rolling. This roller works very close to the finishing machine so that complete compaction takes place when the mixtures are hot. A tandem roller is used for the final rolling operation, principally to remove roller marks and to correct surface irregularities. Diagonal and cross rolling is discouraged where a finishing machine is used to place the resurfacing. Considerable study has been given to the rolling operations and we have concluded that two rollers, if properly operated, should be able to compact and finish all material produced by a plant having a batch capacity of 2,500 pounds or less. Three rollers should be standard equipment on jobs served by larger plants.

The surface-course operations are very similar to those used in laying the binder. Approximately 108 pounds of mixture per square yard is placed for each inch of surface thickness. Illinois specifications do not permit the casting of mixtures on a machine-finished surface, and hand work and hand raking are discouraged. Experience has proved that these hand operations not only cause a disagreeable surface appearance but also tend to create surface irregularities which impair the riding qualities of the resurfacing. Contractors have been able to meet this requirement by maintaining uniform workable temperatures in the mixture and by keeping the finishing machines in proper

adjustment.

Special attention is given to the longitudinal construction joint between traffic lanes; if properly constructed, it will soon disappear under traffic. This joint is made by overlapping the screed of the finishing machine a very small amount on the lane previously laid and should require very little hand work. The joint is then rolled immediately.

Edge construction is also considered rather important, as any material extending beyond the edge of the old pavement will crack and break away from the resurfacing. This is not only unsightly, but is a waste of material and may develop into a maintenance problem.

During the construction of the binder and surface courses, care is exercised to keep traffic off the mixtures until they have cooled. Two flagmen are usually required at the paving operations. Since one lane of pavement is always available, little difficulty is encountered.

One sample of the completed resur-

facing, including both binder and surface courses, is taken from each project. These are cut into small bricks at the laboratory so that the structure of the resurfacing can be studied.

Widening

Consideration is given to the need and possibilities of widening narrow pavements at the time plans are made for resurfacing. Where the vertical and horizontal alignment is considered satisfactory for modern traffic needs, and traffic studies indicate a need for greater width, the old highway is repaired and widened with concrete to 22 feet. The entire width is then resurfaced, resulting in a wide pavement suitable for modern traffic.

Resurfacing Completed

Illinois has completed more than 400 miles of resurfacing since 1933. About 378 miles were constructed during the years 1941, 1942 and 1943. The 1944 program contemplates about 300 miles.

From a paper presented at the First Illinois State Asphalt Conference, in Springfield, Ill., February 23-24, 1944.

PLANNED FORM WORK SPEEDS CONCRETE CONSTRUCTION

Richmond offers without obligation, consultation on the proper types of Forms and Form-Ties to be used for a given job; estimates on job requirements and recommendations on specific Form problems.

Richmond furnishes layout and detail plans covering ties and their application to the form work.

Richmond's method of packing and shipping in accordance with layout plans is a distinct service in itself. Richmond's system of labels and color designations as applied to all cartons and bundles is a definite time-saver, and eliminates confusion. In short, the right material gets to the right spot, without delay.

Richmond's Tyscr principle is that of a wire coil wound to the contour of a lag thread to receive and develop the full strength of the Richmond Tylag bolt. This bolt, by reason of its simple construction and fast thread, can be re-used indefinitely with no depreciation. For instance... $\frac{1}{2}$ " diameter Richmond Tyscrs have a 5 turn coil (resistance welded) to each end of high tensile wires. These coils are 1" in length, hence they have 5 threads per inch as against 13 machine threads per inch on other tie systems. This is an immediate saving of better than 50% in tightening and stripping time per tie.

Richmond's policy of loaning its Form-Tie working parts (tools) free of any rental charge is a big factor in reduced costs because you only pay for lost parts, not for their usage.

Form-Ty Engineering Guide on Request.



Established 1911

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ANCHOR COMPANY, INC.**

216 LIBERTY AVENUE • BROOKLYN, NEW YORK



FIRE CONTROL is another one of those jobs on which Galion motor graders perform with excellence. In our National forests and parks, fire breaks must be kept open to protect our resources. Galion graders are doing a good job of it—as they do on all road building and maintenance—here and abroad.

The Galion Iron Works & Mfg. Co.

Main Office and Works: Galion, Ohio

GALION

Old Wire Ropes Have Many Secondary Uses

(Continued from page 58)

the core. A properly lubricated wire rope will withstand from two and one-half to five times as many bends over sheaves as a dry rope.

Safe Handling

Another safety factor which must be considered in finding new jobs for old rope is whether or not the rope will be handled, and if so, whether it is safe to handle. In ordinary wire rope, the wires are held together under tension, and wear causes them to break and project from the rope or "porcupine". Such a section of worn rope is very dangerous to those handling it. On the other hand the wires in preformed-type wire rope are reshaped to the exact curvature which they take in the finished rope and, when individual crown wires break, they do not stick out, but remain in place. Worn sections of preformed wire rope

are therefore safe to handle because they are not jagged needles which will stab a workman's hand.

There are many places where discarded wire rope may safely be used. Economic production can be maintained and steel can be conserved if other uses are found for worn cable before it is turned in for scrap.

Welding Papers Deposited In Ohio State U. Library

All of the papers which were submitted in the James F. Lincoln Arc Welding Foundation's \$200,000 Award Program of 1937-38, and the Engineering Undergraduate Award and Scholarship Program of 1942-43, have been placed in the Ohio State University's A. F. Davis Welding Library. The papers add substantially to the wealth of welding information in this collection, one of the largest of its kind in the world. It already contains approximately 1,000 books, and other literature on the subject of welding.

Motor-Grader Catalog

A new 28-page illustrated catalog, No. 285, depicts the many types of work that can be done by Galion diesel-power tandem-drive motor graders, including road maintenance and widening, ditch sloping, ditching in reverse, ground

leveling and bank cutting. This is followed by a list of the outstanding features of Models No. 101 and 201 which are the ones described.

Copies of this catalog may be obtained by writing to the Galion Iron Works & Mfg. Co., Galion, Ohio, and mentioning CONTRACTORS AND ENGINEERS MONTHLY.

THIS IS THE PUNISHMENT SISALKRAFT IS TAKING IN WAR SERVICE!



PUT SISALKRAFT FIRST ON YOUR POSTWAR LIST!

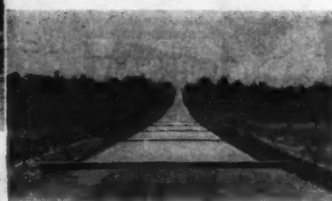
Normally used for concrete curing, SISALKRAFT is protecting deckloads of war supplies exposed to arctic ice and tropical humidity — to sleet, snow, rain, wind and dirt!

Can you think of a more severe test than this direct exposure to the elements and the rough, hurried handling that war supplies must take?

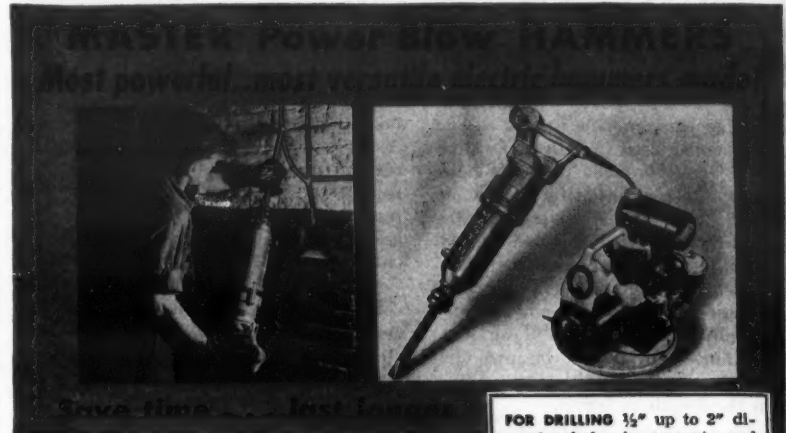
Those very same properties that enable SISALKRAFT to protect war supplies are the ones you need for protecting newly poured concrete from rapid evaporation and from damage by frost, drip and debris.



Put SISALKRAFT first on your postwar list — for concrete curing and general job protection. Its low cost, long life and outstanding performance are a record of nearly 25 years of satisfactory service.



Manufacturers of SISALKRAFT, FINISH, SEAL-X, SISALTAPE and COPPER-ARMED SISALKRAFT



Available with tools for drilling, cutting or spading. Will do light duty work or any heavy duty work. The Master Hammer runs without striking a blow until pressure is applied, enabling operator to control blow as job requires. Easy and economical to operate. Built for light weight and long service. Used throughout the world. Power blow hammers operate on 115 volt AC or DC, 25, 50, or 60 cycle. If no electricity is available use Master Portable Generator Plant Model 650 (illustrated above).

Write for Bulletin 500 for complete details.

FOR DRILLING 1½" up to 2" diameter holes in concrete and other hard materials.

FOR CUTTING concrete and other materials. For vibrating, tamping, chipping steel, cast iron and wood... scaling and caulking... peening welds and other heavy work.

FOR SPADING, cutting clay and similar materials.



MASTER VIBRATOR COMPANY

Dayton 1, Ohio • Distributors throughout United States and Canada

Products include: Concrete Vibrators, Gas or Electric Surfacing Attachments, High-Speed Tools • Vibratory Concrete Finishing Smeads • Rotary Concrete Floor Finishing Machines • Portable Gas Electric Generator Plants, 500 Watt to 17000 Watt, voltage Regulators and Portable Mountings Optional • Master Flood and Street Lights • Electric or Gas Engine-Driven Power Blow Hammers



GRIFFIN WELLPOINTS
eliminated sheeting—
lowered water level 16 feet
with lake just beyond an earth dike!

See that bone-dry bottom? Results Count!

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GRIFFIN WELLPOINT CORPORATION

Methods of Sampling For Study of Soils

(Continued from page 41)

Soil Surveys and Borings

To ascertain the conditions existing or to be encountered at roadway cuts, a soil survey is generally necessary. If the cuts are to be shallow and the soil is not gravelly, hand-auger boring is fast and sufficiently accurate. Otherwise, test pits or a power rig are necessary. Sometimes the auger may be used when excavation of the cut has removed the obstacles. For fills with soft foundations and for structures, any of the above may be used. Soil survey and testing should be under the supervision of the soil mechanics engineer.

The sampling methods mentioned can be divided into two categories, by hand and by machine. The former consists of auger borings and test-pit sampling and both are usually made only to shallow depths. The auger gives a disturbed sample, satisfactory for the simple classification tests of the soil, and is quick and economical; the auger will not work in a gravelly soil or in cohesionless soils lying below the water table. Test pits are more expensive, of course, and are difficult to keep open if below the water table in a cohesionless soil. However, excellent undisturbed samples can be taken from pits if the sides or bottom of the pit can be kept stable.

Sampling by machine is done by a boring crew, usually three men, using a boring rig. The rig has three basic parts: an A-frame or a derrick to support overhead pulleys and blocks; an engine with winch or niggerhead to aid in raising or lowering casing pipe, wash pipe, sampler pipe, drill rods, etc.; and a pump to wash up the soil or rock dust. Most rigs also have a coring mechanism, either attached to the engine frame or on a separate frame.

Samples of the soil may be "wash", "dry", (or "drive"), and "undisturbed". Wash samples are taken merely by catching the wash water in a bucket or tub, and are misleading in that the medium and large gravel is not washed up, while the fines do not settle in the bucket but float away with the water. Dry samples are taken by driving a sampler pipe into the soil and then raising the sampler to the ground surface. Such a sample is greatly disturbed, but all of the aggregates are present. In cohesionless soils below the water table, it is necessary to use a check valve or piston and/or a flap to prevent losing the sample. Undisturbed samples are similar to dry samples, except that they are taken in thin-walled tubing and penetration is by a single quick stroke. Since they are used for "stress-strain" tests, such as shear, consolidation, and other important tests, great care should be used before, during and after sampling. Dr. M. J. Hvorslev has made a thorough investigation of undisturbed sampling for the American Society of Civil Engineers and his preliminary report, published in 1940, is a classic on the art of undisturbed sampling.

Obviously sampling is extremely important, but in many places it is given much less attention, and hence is less accurate, than testing and analyses. Possibly this is due to such things as the inconvenience of traveling to the site, weather conditions, and the inability to make the foreman understand the forces involved and their effect on the sample

before, during and after taking the sample. Progress has been made: the wash sample is now generally considered unsatisfactory, blow counts are now taken on the dry-sampler pipe instead of on the casing, and thin-walled tubing is coming into more use for undisturbed sampling. The soil mechanics engineer generally supervises or cooperates with

the boring crews and it is his duty to insure that accurate samples are taken.

It costs a pretty penny to tell drivers where they are going. The California Division of Highways reports an average annual pre-war expenditure of \$74,500 for highway signs, and a total of \$716,655 since 1925.



Marmon-Herrington Airborne Tanks SPEARHEADED NORMANDY INVASION

From designing and building trucks, to the production of airborne tanks *might* seem a long distance for any manufacturer to travel. The design and production problems *might* seem to be dissimilar.

But not for Marmon-Herrington.

For Marmon-Herrington has always built unconventional types of vehicles—*All-Wheel-Drive* trucks, track-laying tractors and tanks, even before the war began.

So, early in the war, when military strategy

anticipated the need for a large number of light, highly maneuverable airborne tanks for invasion operations, it wasn't strange that Marmon-Herrington was asked to build them. Nor was it strange that they performed with great effectiveness when carried in giant gliders over, and landed *behind enemy lines*.

Our real business, however, is *trucks*—and we hope it won't be long until we can build all our customers need of them, for the many peacetime projects delayed by war.

★ BUY MORE IN '44... WAR SAVINGS BONDS ★

MARMON-HERRINGTON

All-Wheel-Drive TRUCKS

MARMON-HERRINGTON CO., Inc., INDIANAPOLIS 7, INDIANA

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La Crosse
Heavy Duty Machinery
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For All Purposes

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LA CROSSE TRAILER &
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Buy Bonds Regularly



DESIGNING ENGINEERS:

Positions open at Barber-Greene Company for mechanical engineers on design of equipment for road construction, ditching, aggregate handling, coal handling, and general conveying applications.

BARBER-GREENE COMPANY
Aurora, Illinois

Jobs in Construction For Disabled Veterans

(Continued from page 65)

one type or another. It is equally the responsibility of contractors, in making plans for post-war jobs, to analyze their personnel needs and decide now what types of jobs can be done satisfactorily by men with various kinds of physical limitations.

Herbert M. Hale of New York, who has served as Project Manager on a number of large construction projects in the east in recent years, writes:

"Your editorial bearing on the inclusion of disabled war veterans in construction and engineering post-war planning is a timely view of a problem that needs advance consideration so that the construction and engineering industry will not be lacking in its duty toward the returning injured veteran.

"The industry could well use disabled men on their job staffs in the timekeeping, accounting and storehouse departments. In most cases, contracting firms in post-war construction will have to build up these departments on those jobs yet to be started."

Then Mr. Hale makes a suggestion which we feel has considerable merit. He goes on: "The filing of a pledge of intent with the particular industry association would keep alive this thought brought out by your editorial. And along with the usual captions of most letterheads, such as that the firm is a member of a contractors' association, there could well be added either at the top or along the bottom of the sheet

WE HAVE PLEDGED WORK
FOR DISABLED VETERANS

Collection of Papers On Features of Pumps

The Hydraulic Institute, a national trade association of pump manufacturers, has announced the publication of a group of engineering papers on subjects pertaining to pumps, under the title "Engineering Papers—Fourth Annual Contest". This publication is the outgrowth of contests initiated by the Institute and held annually to encourage the employees of its members to contribute something of value to the indus-

try in theory, design, or practical application of pumps.

The subjects covered in the current volume include: special operating conditions of centrifugal pumps; a common language for hydraulic engineers, a glossary of terms used in the industry; critical speed; suggestions to make present direct-acting steam pumps meet wartime production requirements; and the effect of entrained or dissolved gas on rotary-pump performance.

Copies of this publication may be secured from the Institute, 90 West St., New York 6, N. Y., for \$1.50 per copy plus postage.

Ohnstad Rejoins Pioneer After Two Years Abroad

Orval "Bud" Ohnstad has returned to the sales staff of the Pioneer Engineering Works of Minneapolis, Minn., after a two-year leave of absence. In 1942 Mr. Ohnstad left Pioneer to work as a quarry superintendent for Johnson, Drake & Piper Co. in Eritrea, East Africa, where he set up and operated a large Pioneer quarry plant. He finished his job in one year and returned to New York. Next, he was hired by the McWilliams Dredging Co. and sent to Greenland where he set up and operated two more Pioneer crushing plants.

Steel Workers Return From War to Old Jobs

One out of every twenty steel employees who left the mills for military service has already gone back to work for his former company, a survey of steel companies by the American Iron and Steel Institute reveals. Since passage of the Selective Service law late in 1940, almost 214,000 steel employees have left their jobs for military service, which is 38 per cent of present employment.

Of that total, 10,100 have been released from the services and have now returned to their old companies, while 600 more have gone back to work in other steel companies. In addition, about 3,400 ex-service men never before employed in steel plants have been hired by steel companies.

The great majority of returned ex-service men have been fully capable, both physically and mentally, of resuming their peacetime jobs. Less than 2 per cent have come back with disabilities that have required special handling.

Tractor Service Manual

The third revised edition of the Allis-Chalmers Service Manual for the HD series of diesel tractors is available to tractor owners and operators. This 322-page manual is replete with illustrations,

diagrams, tables, descriptions of assemblies, adjustments, detailed specifications and complete overhaul instructions. Copies may be secured from the Industrial Service Department of the Tractor Division, Allis-Chalmers Mfg. Co., Milwaukee 1, Wis., at \$1.50 each, postpaid.

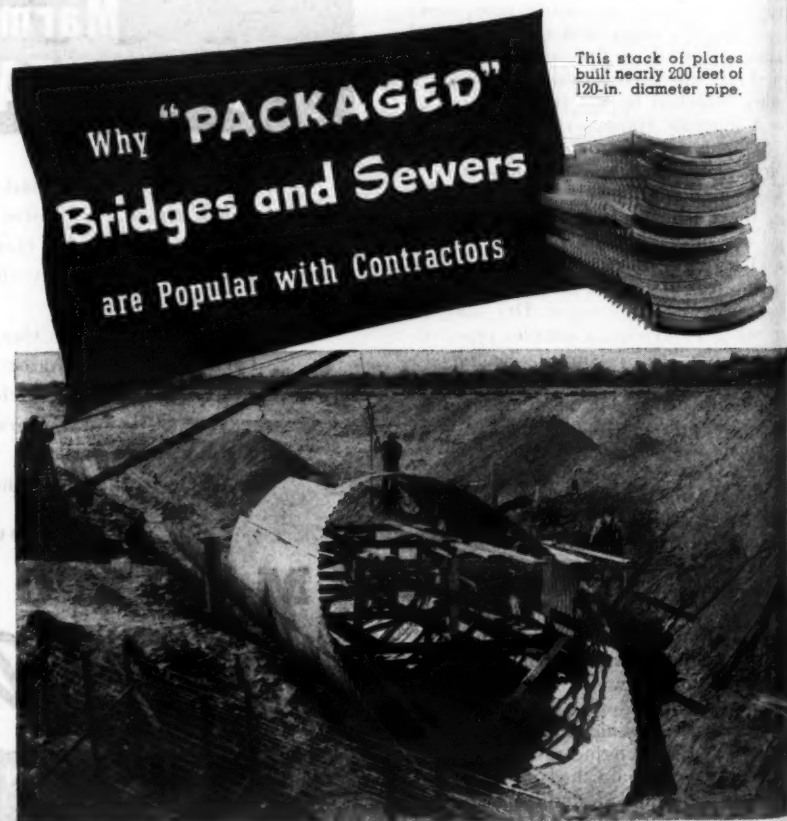


REINFORCED HIGHWAYS CONTINUE TO SHOW SUPERIORITY IN PERMANENCE AND LOW MAINTENANCE. EVER-GROWING WHEEL LOADS REQUIRE HIGHWAYS BUILT TO WITHSTAND INCREASED STRESSES. STEEL REINFORCEMENT PROVIDES THE ONLY INSURANCE FOR LONG AND USEFUL SERVICE OF OUR NATION'S PAVEMENTS.

Specify LACLEDE'S PAVING STEELS

LACLEDE STEEL COMPANY

ST. LOUIS, MISSOURI



This stack of plates built nearly 200 feet of 120-in. diameter pipe.

Erecting a "packaged" culvert, 165 inches in diameter.

Just as shipbuilding methods have been revolutionized by prefabrication and other time-saving methods, so will post-war construction be simplified and speeded by product manufacturers and contractors. One of these practical ideas is the "packaging" of small bridges and large sewers.

Almost as simple as changing a tire on an automobile is the assembling and bolting of Armco Multi Plate. The easily-

handled, pre-curved corrugated plates are nested together for saving space in shipping, hauling and storing. Construction is done with unskilled labor and the simplest equipment.

The "form" is the finished structure. No curing, no waste, no delay. Other operations are speeded up too.

Armco pioneered and developed this "packaged" product. Before the time comes to bid and build these structures get complete information from Armco Drainage Products Association, 385 Curtis Street, Middletown, Ohio.



Armco Multi Plate

STRAYER PORTABLE CONCRETE PLANTS



Make 20 to 40 yards of specification concrete per hour on the job. One-man operation and a helper to

20 to 40
YARDS
PER
HR.

handle cement bags. One hour to set up. Move from job to job. Write for booklet today.

ERIE STEEL CONSTRUCTION CO.

ERIE, PENNSYLVANIA

Aggre Meters • Buckets • Concrete Plants • Traveling Cranes

Maintenance Reviews Plans at the Start

Connecticut Requires the Bureau of Maintenance to Check Road Location And Plans to Reduce Costs

† THERE is an engineer on the roster of the Connecticut State Highway Department with the title "Construction-Examiner for Maintenance". It is an unusual title but covers one of the most common-sense jobs to be found in any highway department. It is considered so important in Connecticut that it is occupied by a former Division Engineer. When asked what his title really indicated, C. A. Campbell replied, "I am the watchdog of the Bureau of Maintenance to see that construction projects contain nothing that will increase maintenance costs".

The Construction-Examiner for Maintenance goes into the field, as the representative of the Maintenance Engineer, with the Design and Location Engineer and the Roadside Development Engineer ahead of construction and analyzes location and design from the maintenance angle. One of the biggest problems in the past has been to prevent melting snow running across super-elevated sections of road to cause a serious hazard when it freezes. This is only one of many problems which have been solved by this office.

As soon as construction projects are mapped and tentative lines and appurtenances shown, the Design Section notifies the Maintenance Bureau of the time of a field inspection. The field inspection by the Design, Maintenance, Resident, and Roadside Development Engineers is to see if the design is adequate and to allow any of the bureaus represented to make suggestions. This applies even to sections of highway which are to be abandoned to the towns.

The duties of the Maintenance Engineer as represented by the Construction-Examiner for Maintenance is to look over the plans and make recommendations, paying particular attention to any apparent weaknesses or otherwise undesirable features which might cause added maintenance costs or necessitate making changes after construction has been completed.

The investigation includes a careful study of all details of drainage structures and outlets, with rights; the stability of subgrades and slopes; cross slopes, especially in respect to snow removal and snow water; and the stability of rock-cut slopes. It also includes the relation of proposed improvements to existing improved property driveways, safety features, guard rail versus flat slopes, sections which might be abandoned to the towns, and all other features that would have a bearing on future maintenance operations.

The Design Engineer makes a written

report which is sent to the Engineer of Location and Design. On this report are shown all the recommendations for changes that have been made by the inspecting group, with the name of the recommender being given in each instance. A copy of this report, with the action taken on each item and the reason therefor, is sent to each interested bureau.

After the plans are made, and before the contract is let, prints of the plans are made up and sent to the Engineers of Highway Control, Maintenance, and Roadside Development, the Resident Engineer, and the proper official of the town where the project is located. When the plans are received by the Maintenance Engineer, he checks them to see that the recommendations adopted are incorporated in the plans, as well as checking for any other necessary changes, and a report of this examination is made to the Engineer of Design.

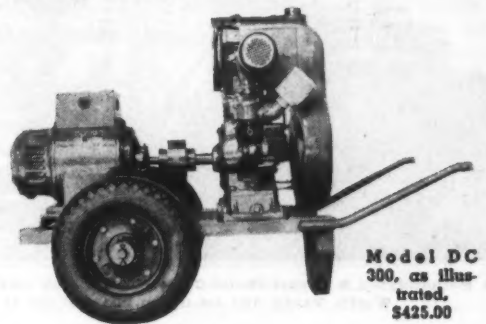
Particular attention is called to the fact that changes at this time are expensive.

(Concluded on page 87)

Light and Power for the Contractor

Superior Features

1. Constant Voltage
2. Tropical Insulation
3. Splash Proof
4. Flyball Governor
5. Oversized Fuel Tank
6. Foolproof Coupling
7. Oversized Engine
8. Moderate Cost



Diesel and gasoline engine driven light and power plants 2 to 50 K.W.
Floodlights and portable poles.

Rentals

Sales

IMMEDIATE SHIPMENT

Why B-E-T-H-L-E-H-E-M F-O-R-M-S-E-T spells E-C-O-N-O-M-Y

One of the greatest advantages of Form-Set (Bethlehem's preformed rope) is an inherent "bendability" that makes it ideal for use with small sheaves and drums, and where sharp reverse bends are necessary. As the preforming operation greatly reduces internal stresses and strains, Form-Set rope will naturally last longer—and do the job better—where highest resistance to bending fatigue is required.

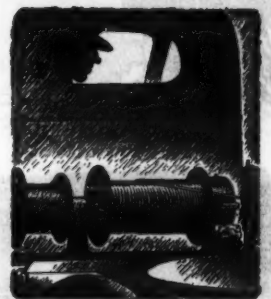
Increased rope life naturally means a saving of overhead. There's a cash value, therefore, in every extra day of Form-Set's life.

And that's not the only saving. The longer your ropes remain in service, the less your machines are "down" for rigging . . . the less productive time you lose.

These are a few of the solid reasons why Form-Set means overall economy in such a wide range of industries—industries that use power shovels, cranes, derricks, overhead air and electric hoists, and many other types of machinery.

Bethlehem makes wire rope in all standard grades and constructions, any of which can be supplied with the Form-Set feature. In addition, we maintain a staff of engineers whose business it is to work closely with you on wire-rope problems.

When you think WIRE ROPE
... think BETHLEHEM



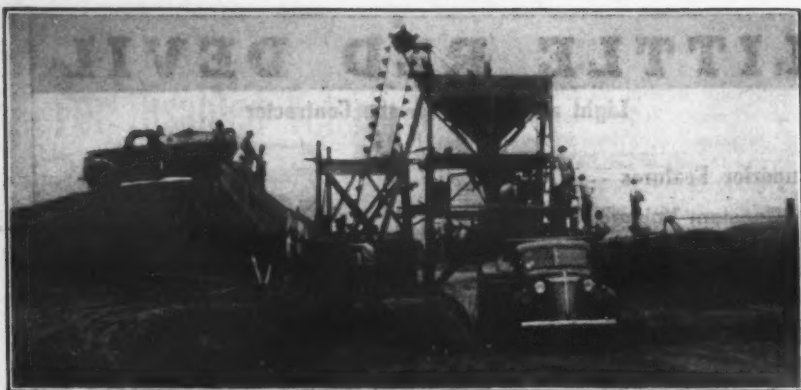
\$25

Saves \$500

PINOLA preserves your lumber.
PINOLA eradicates Termites.
Termites eat while you sleep.
Give them time and you won't
have a place to sleep.

Lumber properly treated with PINOLA is the equivalent of Original Heart Pine. Twenty-six years of test prove it best. Every user of PINOLA is a booster. If your dealer cannot supply you write to us.

THE PINOLA COMPANY
Savannah, Georgia



A Hetherington & Berner Model C-30 asphalt plant, owned by Ned B. Hoffman of Fort Worth, Texas, and set up on his road job at Floresville, Texas.

Low-Cost Pavement From Portable Mixer

A new portable mixing plant designed for long life, low maintenance, and low-cost-per-ton of mixed material has been announced by Hetherington & Berner Inc., 701-745 Kentucky Ave., Indianapolis 7, Ind. These Model C plants have mixing capacities ranging from 400 to 8,000 pounds, giving an output up to 250 tons per hour.

The plants are of knockdown-type construction with a removable bin so that they are easy to move by truck or trailer. The mixer and drive are permanently mounted on a steel platform to insure rigid operation. Aggregate and asphalt are batched by weight, giving control of the output. These plants are designed primarily for cold-mix but it is possible and practical, according to the manufacturer, to make later additions of driers, screens, or other items which may be required by changed specifications or conditions or for the

production of hot-mix.

The same type of twin-shaft pugmill mixers as are used on H & B hot-mix plants is installed on the Model C. These plants are fed by either clamshell buckets or belt conveyor as desired. Gasoline, diesel, electric, or steam power may be used to drive the plant.

Bulletin C-44 recently issued by the manufacturer gives complete specifications of all sizes of Model C plants. Copies of this bulletin will be sent promptly to readers of CONTRACTORS AND ENGINEERS MONTHLY addressing their requests direct to the manufacturer and mentioning this item.

New Euclid Northwestern Representative Appointed

The appointment of M. Hayes Johnson as Northwestern District Representative, covering Utah, Idaho, Oregon, Washington, British Columbia and Alberta, has been announced by The Euclid Road Machinery Co. of Cleve-

land, Ohio.

Mr. Johnson has had wide experience in the heavy equipment field, having been associated formerly with the Morrison-Knudson Co. as superintendent of construction and having specialized in the sale of heavy machinery for the Intermountain Equipment Co. of Boise, Idaho, for the past nine years.

New Self-Contained Breakers, Rock Drills

In certain types of work a self-contained rock drill or breaker has distinct advantages. There is no need for a portable compressor which would be difficult to move over exceedingly rough terrain. Warsop Sales, Inc., 420 Lexington Ave., New York 17, N. Y., has placed on the market a new completely self-contained breaker and a rock drill with a complete line of hexagonal-shank tools for the breaker and hollow drill steel and detachable bit rods for the drill.

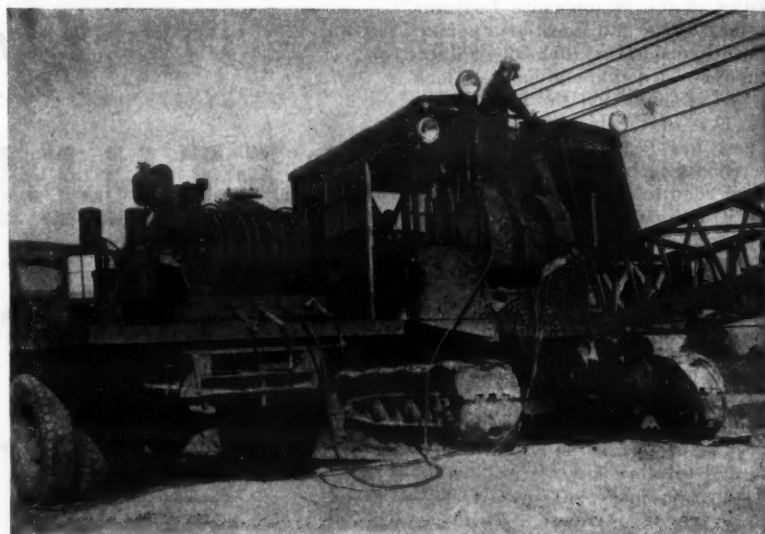
The Warsop hammer, weighing only

90 pounds, is powered by a 2-cycle gasoline engine built into the tool itself and which will operate it for 8 hours on 3 gallons of gasoline. The unit delivers 2,300 blows per minute provided by the power of the engine which, however, has no metallic contact with the hammer piston.

Both the hammer and the drill have throttle controls, permitting the operator to idle the engine while spotting his work and then speeding it up for the job. The machine will operate at full capacity from a vertical position to within 15 degrees of the horizontal and is self-lubricating, using a pint of lubricating oil to 2 gallons of gasoline.

The drill operates on the same principle as the breaker but gives a one-fourth turn to the drill steel with each blow, cutting at the rate of 4 inches per minute in hard granite, according to the manufacturer.

Complete information on the new Warsop self-contained breakers and rock drills may be secured direct from the manufacturer by mentioning this item.



Air-Powered FIELD LUBRICATION *Anywhere!*

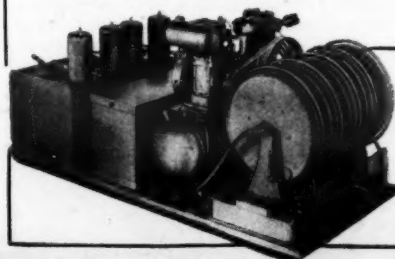
• Your big units have tremendous power to do tremendous jobs and a basic ruggedness to produce profits for a long time. Yet without proper lubrication they wear out faster, break down, cause expensive delays.

If you give your equipment a regular diet of grease you can cash in on all the goodness that has been built into it by their makers. Regular greasing calls for a "schedule of lubrication" which means the right grease, at the right time, applied with the right pressure. When your equipment is field-serviced with a Graco Convoy Luber, you can be certain that "lubrication schedules" will be met on time.

The Graco Convoy Luber is a self-contained, air operated, high-pressure, portable unit that brings the right lubricant to the equipment. Its heavy duty pumps dispense track, gear, chassis and hypoid lube. Essential hand guns, tools and accessories are standard equipment. Tires can be serviced by the 50 foot air line.

Make certain that "Lubricating Schedules" are met on time with a Graco Convoy Luber. Write for Catalog No. 164.

GRAY COMPANY, INC., Minneapolis, Minn.



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ROLLING RUNWAYS TO TOKYO!!



With every advance on the road to Tokyo are the airfields with their runways made carpet-smooth with American equipment.

Prominent in the preparation of these runways are Buffalo Springfield rollers... the same rollers that will again serve in peacetime.

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THE BUFFALO SPRINGFIELD
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SPRINGFIELD, OHIO, U. S. A.

Status of Planning For Tenn. Highways

(Continued from page 73)

believe that satisfactory traveling facilities should be provided for all communities before large sums of money are spent on express highways in a rural state. There is, however, an estimated improvement to cost \$33,253,550 needed on what is designated as the Interregional system in Tennessee, based on normal standards and not on the standards for the Interregional Highway.

To summarize the highway needs in Tennessee, there are 4,702 miles of needed new construction and reconstruction, and 1,232 bridges to be constructed or improved. Further there is needed, for improvement or light construction 1,151 miles, the sum of \$4,730,000, which amount is not included in the overall total, nor is the recent Army maneuver damage included.

Tennessee's highway system has suffered three years of curtailed maintenance, inadequate equipment and insufficient repair parts; three years of heavy hauling of civilian and military supplies; and two years of heavy troop movements over all of the main arteries of the state. Roads which under normal traffic require only a minimum of maintenance expenditure now demand immediate restoration because of almost complete failure. Many of our highway locations are inadequate because of the necessity for greater speeds, wider vehicles, and heavier loadings, and many of the pavements have reached the point of retirement. We look toward tomorrow as a day of increased demands on our highway systems. They must be constructed on higher standards to carry heavier loads and they must be made safe for faster speeds.

Present Status of Plans

Tennessee proposes to make every effort to match every Federal dollar made available for post-war highway construction. Whatever money is received, we shall apply to the needs of our highway system based upon "use importance" of the road and the growing demands of our traffic requirements.

At the present time, the Department of Highways has plans for about \$8,000,000 of construction, another \$8,000,000, plans for which can be completed within a year, and about \$8,000,000 in surveys ready for the design and plans stage.

Some means should be devised whereby the Public Roads Administration could review, pass upon, and approve these plans prepared by the state immediately, and enter into a tentative program agreement. In this way, much time and possible grief could be forestalled; otherwise at the end of the war, every state will be channeling its plans into Washington at the same time, creating a "bottleneck" sufficient to hinder materially a well planned program.

States which, under condemnation proceedings, have to show the "necessity" for the right-of-way sought would then be in a position to show to the Court the tentative State and Federal

program agreement, accompanied by an approved set of plans, all of which would have material weight with the Courts and would enable that state to begin the acquisition of rights-of-way immediately.

Personnel Problem

The problem of personnel in the engineering department reached a serious stage in Tennessee before the restrictions brought about by the war were felt. The Department of Highways lost many of its experienced men to the TVA which was actively engaged in a large construction program at that time. The additional toll taken by defense activity within the state further depleted its personnel.

The Department has attempted, however, to keep a nucleus organization in all of its departments and, through these faithful and experienced men, it has been able to keep its work going, contributing freely to the access roads leading to the many defense areas throughout the state. Many of these men today

are doing work formerly divided among several persons, and much could be said of their faithful devotion to a Department with which they have long been associated.

Even with the handicap of a reduced personnel, the Tennessee Department of Highways set about to make a study and complete plans for a time when road work could be resumed on a normal basis. The study was completed and progress is being made in the preparation of plans and specifications so that contracts can be advertised and let as soon as possible.

Financing

Tennessee has a 7-cent gasoline tax. Of this, 2 cents goes directly to the counties for the purpose of maintaining roads which are not part of the state highway system. The revenue derived from the remaining 5 cents of the gasoline tax is, used to pay interest and amortize the state debt and to match Federal-Aid for the construction of roads. The amount of revenue from license fees goes to the

maintenance of the state highway system.

Highways of the Future

By reason of its geographical position and its length, Tennessee is strategically located on most of the north-south highways between the Great Lakes and the Gulf of Mexico, and similarly is it located on many east-west routes. Traffic from the east coast going west is funneled through the state on two of the all-weather east-west routes to the single crossing of the Mississippi River at Memphis.

In peacetime, Tennessee is within one day's drive of one-third of the nation's population. With its location in relation to the other states, its peculiar shape and area, its population and its agricultural and manufacturing pursuits, Tennessee fits into the three main highway schemes of future transportation, which are the development of the state and Federal system, the development of the strategic network, and of the Interregional System, and to this end the Department of Highways dedicates its efforts.



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The United Nations are putting the squeeze on the Axis. Stout steel muscles of Wickwire Rope are doing everything they can to apply the pressure.

How? In forests, mines, oil fields and shipyards the strong, flexible muscles of Wickwire Rope are helping produce supplies for our fighting

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speed supplies to hasten destruction of Axis strongholds.

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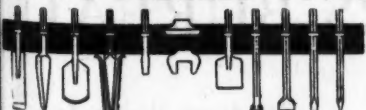
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Scenes at the casting yard where the concrete stringers for the rebuilt sections of the storm-damaged Lavaca Bay Bridge in Texas were poured. Top, assembling the reinforcing. Next, setting up the forms for the last of a group of ten stringers. Third photo, a close-up of the end of a group of stringer forms. Last, a group of stringers with the forms stripped, and showing the concrete-pouring runway. Forty stringers were poured each day. See page 1.



Two ways of clearing snow from the edges of plowed highways under varying conditions. Montana uses a Rotoblade traveling at $\frac{1}{4}$ mph to blow snow over a high bank, (as shown in top photo), and under other circumstances, a one-way plow on a $1\frac{1}{4}$ -ton truck traveling at 12 mph to push the snow back as far as possible. See page 23.



U. S. Army Signal Corps Photo

American troops in France put to good use materials and equipment left behind by German troops departing in a hurry. Here, members of an Engineer unit are working on a huge rock crusher found in a quarry, to put it into Allied service at Cherbourg. See page 10.

ing conditions
(as shown in
k traveling at